CITY OF Opportunity

AN INTRODUCTION TO THE INDUSTRIAL POTENTIAL OF

EDMONTON, ALBERTA

CANADA

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TO THE

INDUSTRIAL POTENTIAL

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Prepared for the Commissioners of the City of Edmonton

by

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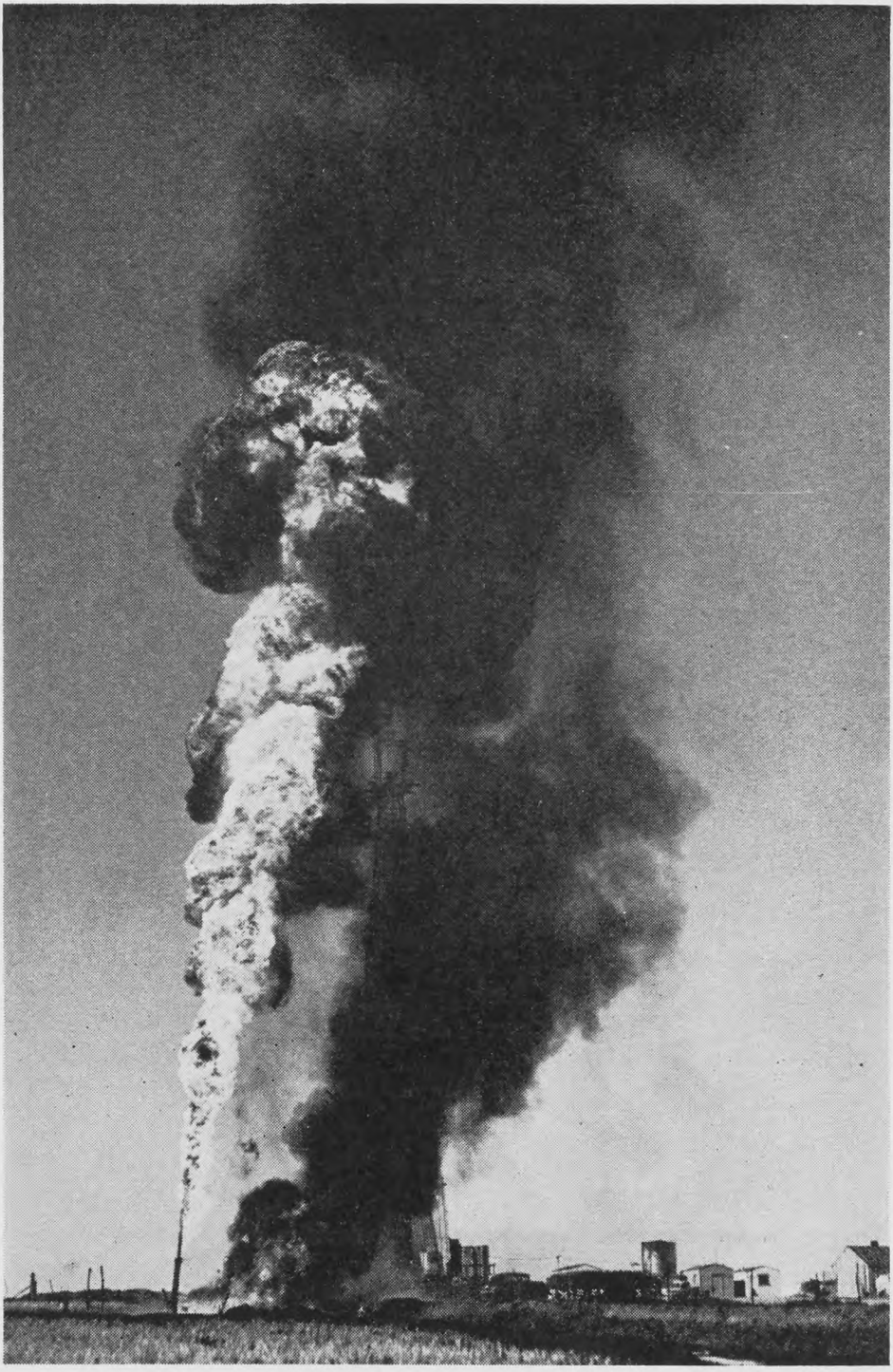

THE WONDER WELL COMES IN

February 10th, 1949, saw Golden Spike (Imperial Schoepp No. 1) come in with an initial tested potential of 10,000 barrels daily from a pay zone of 545 feet. There are not many wells in existence with a pay zone in excess of 545 feet. The well is situated a few miles west of Edmonton, Alberta.

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EDMONTON

Canada's New Centre of Industry

INTRODUCTION

Since the beginning of industrial history, industries have located in certain places because of one or more specific reasons. Either raw materials were readily available or transportation facilities existed which were not obtainable elsewhere, or, as in later days, because of a large concentration of population, or the location of other industries.

Up to the present time the main concentration of industry in Canada has been in the East, largely because it was the first part of this vast land to be populated, and secondly because it was easier to reach other markets.

In a new and growing country such as Canada, times and conditions change rapidly and none more so than in Western Canada, particularly Alberta, and specifically, Edmonton. It is almost true to say that the economic, commercial and industrial history of Edmonton is changing so rapidly that anything written today would be out of date before it could be put into print.

To practiced observers from all parts of the world—who have been to Edmonton to see for themselves—this City offers more scope and inducement for industrial expansion than almost any other place on earth.

Being mindful of the factors governing the importance of Edmonton, the City Commissioners are anxious to see the City expand on sound, planned lines. They are also eager to assist any new industrial enterprise to become located, secure in the confident knowledge that Edmonton is a natural centre for industrial expansion.

To this end, they desire to present to industrialists wherever they may be—in Eastern Canada, the United States or Great Britain—some factual information that would be of use to them in determining the importance of Edmonton as a future centre for the location of their industries.

The following work, therefore, is intended to be an industrial guide to Edmonton. It in no way attempts to describe the beauties of the the surrounding country, but deals only with Edmonton from an industrial point of view.

Every effort has been made to check the accuracy of the figures given, and if more detailed information is required, it can be obtained from the Industrial Commissioner for the City of Edmonton, Civic Block, Edmonton, Alberta.

GENERAL REVIEW

One hundred and fifty years ago, Edmonton was a trading post. Today, it is a thriving city with a population expected to reach 146,000 by the end of 1949.

Ever since the West began to become settled, Edmonton has shown itself capable of meeting the change, not only to its own advantage, but to the advantage of all who have settled within its sphere of influence.

What is this sphere of influence today?

Firstly, Edmonton lies on the main line of the Canadian National Railway running from the East to the West coasts of Canada and having many hundreds of miles of track feeding into the country North and South of the main line. This line connects Edmonton with the up-to-date seaport of Vancouver where readily available facilities exist for the export of goods manufactured under the ideal fuel and production conditions which are to be found in Edmonton.

This is a feature of Western industrial economy which has not been investigated to any great extent so far. However, with the rapid industrial growth going on in the West, an outlet will have to be found for the surplus of production which will become available. As a study of the position will show, Edmonton is the natural centre for industrial expansion in the West, and an outlet for the surplus productivity of this expansion could well be found through exporting via Vancouver. Nothing is more certain than this, especially in view of the fact that the differential mountain freight rate has been abolished and both the major railway companies are anxious and willing to co-operate in increasing trade over these routes. In addition, Edmonton is the Southern terminus of the Northern Alberta Railway, which penetrates into the rich agricultural country to the North, and affords access to the vast mineral deposits to be found in the Northwest Territories, adjacent to Alberta's Northern boundary.

This tremendous area, which is being developed rapidly, looks on Edmonton as its main supply base, and the City as a result enjoys a great amount of business, which will be still further increased as new industries locate within the city.

Edmonton is known as the "Gateway to the North". It is also referred to from the aviation point of view as the "Cross Roads of the World". This reputation has been built up because of the amazingly good transportation facilities which characterize the City, and make it such a potentially important industrial centre. From Edmonton, it is possible to reach, with comparative ease,

not only the whole of Canada and the United States, but almost any part of the civilized world.

The discovery of oil in Alberta in such amazing quantities is yet another factor contributing to the desirability of Edmonton as a centre of industry. This important discovery has had the effect of changing the whole future of Canada's economy. Within a few years it is expected that Canada will be self-sufficient in oil, and will be ready to begin large scale exports. Almost daily fresh areas are being explored and new wells are being brought in, each with assuring quantities of good crude oil. These new oil fields are estimated to extend from some 90 miles south of Edmonton on to the Arctic Circle.

In the very centre of this activity stands Edmonton. At the moment the needs of the oil industry have to be met by importing requirements from the United States or in a few instances, from Eastern Canada. With the growth of industry in Edmonton, it is hoped to be able to provide the oil industry, at some future date, with most of its requirements, manufactured in Canada's Oil Capital by the people who live there, and with the aid of the abundance of cheap fuel for which the Province of Alberta has become famous.

Probably no other place in the world is so well served by fuel as Edmonton. It is true to say that the city stands on a vast coal bed, and is surrounded by coal for many hundreds of miles. These coal fields are well served by both the C.P.R. and C.N.R. and the coal is available in Edmonton at a very economical figure. There is a great opening in the vicinity of the City for the chemical and ceramic industries, as large salt deposits are also available close at hand.

Perhaps the most important factor in Edmonton's favour as an industrial centre, is the tremendous quantity of natural gas available. This gas has a very high calorific value, and besides being cheap, is in every way suitable for industrial purposes.

It will be seen from the foregoing information that Edmonton presents to the industrialist seeking expansion a very attractive opportunity to become established in a virile and expanding community. The West is going to develop rapidly in the next decade and now is the time for new industries to get themselves located.

The opportunities offered by Edmonton as a centre of industry are comparable with those offered by the older industrial centres when they first became established. The foresight of the men who started in Manchester, Sheffield, Pittsburg, Detroit, Toronto and Hamilton, has been amply repaid, yet when they started the conditions they had to face were not as good as those confronting an industrialist commencing in Edmonton today. Under modern production methods industry has become more efficient than it was a hundred years ago. New industries in the

West should therefore be easily able to match the competition from more established areas.

The West needs industries to balance its agricultural economy. All the signs point to the fact that industry is coming to Edmonton, which city stands ready with a warm welcome and with all its facilities to assist it.

The recent Report of the Royal Commission on natural gas, draws attention to the importance of Alberta in Part II, Sec. IX, which says:—

> "Alberta, a young province with limited population, is as yet not industrialized to any extent. However, as pointed out in Research Council of Alberta Submission, Alberta is a rich agricultural province with large potential reserves of energy in the form of coal, oil, natural gas, bituminous sand and hydro power. In addition, large areas of forests occur in the Western and Northern parts of the Province, and deposits of limestone, shale, clay, sand, salt, etc., occur in other sections of this Province. The combination of raw materials for industry, large reserves of materials for producing heat and power, and a rich agriculture to support growth in population, makes Alberta occupy a unique position in the economy of Canada. The policy to be adopted in the development of these resources is therefore of prime concern not only to Alberta but to Canada as a whole."

NATURAL GAS

Perhaps one of the most important factors leading to the Industrial Development of Western Canada is the availability of natural gas at a price which makes it supreme among all other types of fuel.

Edmonton draws its natural gas, at the moment, from the Viking-Kinsella Field. This field has an estimated reserve as at September 30th, 1948, of six hundred and thirty-two billion cubic feet, while in 1949 the proven reserves for the Province were put at 4.26 trillion cubic feet. As the annual consumption of the Edmonton gas district is in the region of eleven billion cubic feet per year, it will be seen that the City is in a very satisfactory position with relation to this valuable commodity. In addition to the Viking-Kinsella field, there are now known to be large reserves of natural gas, as yet unused, in such locations as the Leduc oil fields situated some 17 miles southwest of the city, and other oil fields discovered within the past two years.

The natural gas in Edmonton is distributed by Northwestern Utilities Limited, which has the industrial development of the city very much in mind. The Company is prepared to assist industry coming to the city to obtain supplies of natural gas as easily and economically as possible, and several extensive new developments in this direction are planned for the next year or two.

The following analysis was obtained from two samples of gas being supplied to Edmonton. The values obtained, together with the average are shown below.

PER CENT BY VALUE

	1	2	Average
Methane	94.0	93.7	93.9
Ethane plus *	0.85	0.87	0.86
Nitrogen (by difference)	4.6	4.8	4.7
Carbon Dioxide	0.10	0.10	0.10
Hydrogen	0.35	0.36	0.36
Oxygen	0.12	0.13	0.13
	100.	100.	100.

* and heavier reported as Ethane.

The specific gravity of the gas was found to be 0.581 based on air having a specific gravity of 1.00.

The gross heating value is 950 b.t.u. per cubic foot at 13.82 p.s.i.a. and 50°F.

RATE SCHEDULES

The present rate schedules are given as a guide only and are subject to change without notice. The gas quoted for is Natural Gas—1060 b.t.u. at standard conditions sweet (no sulphur)—specific gravity 0.6.

Domestic, Commercial and Industrial General Rate

First 4 MCF or less .....$2.00 per month
All additional MCF .....20c per MCF

Optional Commercial and Industrial Rate

Class A.

Commercial and Industrial customers whose annual consumption exceeds 13,500 MCF but does not exceed 34,000 MCF.

Fixed charge .....$35.00 per month
Commodity charge .....17c per MCF

Class B.

Commercial and Industrial customers whose annual consumption exceeds 34,000 MCF.

Fixed charge .....$120.00 per month
Commodity charge .....14c per MCF

High Load Factor Rate

Availability: To consumers on annual contract whose annual consumption of gas is not less than 6,000,000 cu. ft. and whose total consumption during the six meter reading periods ending in May, June, July, August, September and October, is not less than 40% of their total consumption for the year.

Fixed charge .....$20.00 per month plus
$1.00 per 1000 cu. ft of maximum
12 hour demand
Commodity charge:
First 1,000,000 cu. ft. .....14c per thousand
Next 1,000,000 cu. ft. .....12c per thousand
Additional .....10c per thousand
Minimum monthly charge.....Fixed charge

Further details of terms of contract etc., may be obtained on request.

NOTES OF INTEREST

475,000 square miles—or 15% of the area of Canada is considered to be prospective oil and natural gas territory.

Small prospective gas and oil areas occur in parts of Eastern Canada and Newfoundland, but the largest area is in the West. This area extends from the international boundary through southwestern Manitoba, southwestern Saskatchewan, covers most of Alberta, and extends northward to the Arctic. It is bounded on the east by the Pre-Cambrian Shield and on the west by the Rocky Mountains.

Edmonton is particularly well suited to become the centre of industrial expansion in the West, because it occupies a strategic position in the middle of seven major oil fields with an assured quantity of natural gas, and is also the logical centralization point for raw materials being brought out from the wealthy Northland.

For further details pertaining to natural gas, reference should be made to the Dinning Report of the Province of Alberta Natural Gas Commission, published in 1949. Some extracts from this report are given later as they may be of interest to industrialists.

The following are some of the by-products obtainable from Natural Gas:

UREA, FORMALDEHYDE, CHLORINATED HYDROCARBONS, METHANOL, ACETYLENE, CARBON BLACK.

All are important industrial materials and offer possibilities of success when produced in commercial quantities. In the opinion of witnesses before the Natural Gas Commission referred to above, it seems certain that in the years to come, the needs of the organic chemical industry will provide for an ever widening market for many products made from Natural Gas.

One of the more important by-products of Natural Gas at the moment, is Carbon Black. It is used as a pigment in inks, paint, varnishes, enamels, etc., and in a very large way, by the rubber industry. If it is added to natural latex it vastly improves the structure and durability of tires and other rubber products. The rubber industry now uses 95% of the carbon black consumed in the United States, which in 1946 amounted to 941.5 million pounds.

In 1946, Canada imported over 41 million pounds of carbon black, valued at over 2 million dollars and in 1947, over 55 million pounds, valued at nearly 3 million dollars. If it is assumed that out of every 1000 cu. ft. of Natural Gas, 8 lbs. of carbon black can be recovered; it would require approximately 7 billion cu. ft. of gas to produce Canada's 1947 consumption of this product. The production of carbon black on a commercial scale would therefore appear to be worthy of very serious consideration

and if properly developed it should be a valuable addition to Canadian economy.

No place offers better facilities for the development of such an undertaking than Edmonton.

EXTRACTS ON INDUSTRIAL USES OF NATURAL GAS
from
THE PROVINCE OF ALBERTA NATURAL GAS COMMISSION REPORT
1949
CHAIRMAN: R. J. DINNING, ESQ.

In 1949, The Government of the Province of Alberta, convened a Royal Commission, to enquire into the whole aspect of natural gas in the Province, and to report and make recommendations under the following headings:—

1. To investigate the existing and proven reserves of natural gas in the Province of Alberta;
2. To inquire into and estimate the potential reserves of natural gas in the Province of Alberta;
3. To inquire into the present domestic, commercial and industrial consumption of natural gas in the Province of Alberta;
4. To estimate the future requirements of natural gas for domestic, commercial and industrial purposes in the Province of Alberta;
5. To make such further inquiries into the situation surrounding the use of natural gas in the Province of Alberta as they may deem necessary, having in mind the best interests of the people of Alberta;
6. To report their findings to the Lieutenant Governor in Council.

The report issued by the Royal Commission, is available on application to the Department of Economic Affairs, The Government for the Province of Alberta, Legislative Building, Edmonton, Alberta.

The following extracts are given as an indication of the industrial potential of Natural Gas, and are taken from Part 2, Section IX, of the Report.

QUOTATIONS.

"The pattern of the industrial utilization of natural gas as a raw material in the chemical and synthetic industries has changed materially in recent years. This fact is borne out by the following excerpt taken from the report of Commissioner Nelson Lee Smith, and Commissioner Harrington Wimberly, Natural Gas Investigation, Federal Power Commission.

'The development of products and production process starting with natural gas has been very slow. This condition has been due principally to the high order of chemical technology

required in any synthetics manufacture, and secondly, to the difficulty of performing the reactions with the relatively inactive hydrocarbons making up dry natural gas. The entire industry of organic synthetics is, in fact, scarcely 20 years old. During the past decade, and more especially in the last five years, the research laboratories of the chemical companies found in dry natural gas as well as in the natural gas liquids desirable properties and qualities for their use as chemical raw materials. It was only during World War II, however, that national importance became attached to the possibilities of large-scale commercial production using the laboratory discoveries which made these developments possible.'

"The advantages of natural gas as an industrial fuel were pointed out in the Submission of the Research Council of Alberta. 'Natural Gas is one of the highest grade fuels for industrial use. Its high calorific value, which is about twice that of most of the higher calorific value gases made from coal, together with the relatively small amounts of excess air required for its complete combustion, means that high calorific intensities and flame temperatures can readily be obtained by burning natural gas in suitable equipment. The ease with which combustion can be controlled and the cleanliness of operation gives it marked advantage over solid fuels. The temperatures and atmospheres required in industrial processes can be closely and easily regulated. Many of the problems encountered in the utilization of other fuels are entirely absent in the case of natural gas. It is essential, of course, that a continuous supply should be available at a price competitive with other fuels."

Note: The current rate tables for natural gas have already been given earlier in this publication, and on page 44 of the Royal Commission's Report will be found tables showing the estimated quantity of natural gas in the existing and proven reserves as of 1949, as being 4,261.7 billion cubic feet. This has been "calculated to 100 p.s.i.a. Abandonment Pressure 60° F." There would appear to be no fear of shortage of supply, or inability to compete with other fuels.

"Evidence presented to the Commission indicates that in considering the future of the natural gas reserves of the Province, due consideration should be given to the use of natural gas for power purposes. Once the capital expenditure for gas mains is made to take gas to or by any location, the gas can be efficiently converted into electrical or mechanical power by either large or small producing units.

"Methods of converting natural gas to power and of its costs per KWHr. as fuel were included in the Research Council of Alberta Submission. One significant statement was that gas turbines of 2,000 KW to 5,000 KW (max.) capacity require no cooling

water other than a small quantity for the lubricating oil system. Such equipment could be installed anywhere in the province irrespective of there being relatively large quantities of water such as are required for steam plants or large gas engines. When large quantities of cooling water are available the steam turbine with its boilers is more efficient than a gas turbine. Steam units up to 60,000 KW outlet are available with optimum efficiency. The use of large steam units with utilization of waste heat for central heating or for use in an industrial plant have attractive possibilities.

Shortages of hydropower in the Provinces of Ontario and British Columbia during the winter of 1948-49 have clearly demonstrated the importance of developing alternative sources of power in Alberta. Because of its resources of hydropower, coal, oil and natural gas, Alberta could by designed development, assure industry of an uninterrupted supply of power and this would be a major attraction to industries with high capitalization and high operating costs."

"Natural gas is of major importance to the synthetic organic chemical industry because of the versatility of hydrocarbon conversion processes, and of the wide variety of chemicals which can be made from the constituents of natural gas. In the production of many other products, not classed as synthetics, increasing quantities of synthetic organic chemicals are used as intermediates in their manufacturing processes. The production of synthetic ammonia, nitrates and fertilizers, not ordinarily grouped with organic chemicals, has experienced a marked expansion using natural gas as the fuel stock, and this shows indications of sustained growth. Markets for many of the chemical products are limited but for others they are large."

J. R. Donald, Esq., a witness before the Commission stated:—

"Looking at the larger field of the markets of Canada, further afield, the petro-chemical industry offers a good many possibilities. In the United States southwest, chemicals, such as acetone, acetic acid, aldehyde, butanol, methanol, synthetic rubber, nylon resin, glycerine and other base materials required in Eastern Canada can in some instances be produced in Alberta and shipped to Eastern Canadian markets. Another range which would seem to offer attractions are the chlorinated hydrocarbons such as carbon tetrachloride, trichlor ethylene, chloroform, etc. Some of these products are made in Eastern Canada from acetylene. It is very possible that with natural gas here, manufacturers could compete in the Eastern markets. As an example of this type of industry, the ammonia plant in Calgary is a good example. Fertilizers produced from the ammonia here can compete successfully in the Eastern Canadian market with similar products manufactured from solid fuel. As a matter of fact, the ammonia plant at Calgary is in a position to turn out various other valuable chemical materials, such as methanol, hexamine, urea, and these materials are base materials for an important range of plastics.

Quite apart from the United States markets to the south, I think it is quite evident that in the larger Canadian market and in other export markets that Alberta industry will be built up and find export outlets".

"Natural gas for fuel in petroleum refining is a recent significant development. Evidence presented at the Natural Gas Investigation of the U.S. Federal Power Commission showed that during World War II, the use of natural gas as a refinery fuel increased 240 per cent from 148 billion in 1941 to 355 billion in 1946, indicating that natural gas provided most of the increased wartime fuel requirements of petroleum refineries.

"The importance of the use of gas for fuel in (these) industries is significant to Alberta, since as stated earlier, Alberta has deposits of limestone, shale, clay, sand, salt, etc. Furthermore, the rapid growth of the petroleum industry in Alberta will necessitate a material increase in the refinery capacity for processing oil."

A witness giving evidence before the Royal Commission on the question of Alberta's industries stated:

"In the first place we have industries such as the cement industry and ceramic industries, which, using mineral raw materials available, find great advantage in the use of cheap fuel in the convenient form as represented by natural gas. It seems evident that the cement industry in Alberta, for example, will expand and will supply the prairie market. The same thing applies to brick, tile, gypsum and other products."

Reviewing other industrial developments in Alberta the same witness said:

"Another type of industry which is bound to expand in Alberta are industries in the chemical field supplying local demands here. The large established salt deposits here in Alberta are a source of salt chemicals. At present these chemicals are imported from Eastern Canada. I think there is no doubt that in the relatively near future, with the future demands arising for these products and the high cost of transportation from the East, that you will see a salt industry established producing such products as caustic soda, chlorine, hydrochloric acid and soda ash. With these basic chemicals available at a reasonable price, numerous other industries become possible".

ACKNOWLEDGMENT

Acknowledgment is due to Northwestern Utilities Limited and to the report of the Province of Alberta Natural Gas Commission 1949 from which the information in the foregoing section was obtained.

OIL

No publication dealing with Edmonton would be complete without some mention being made about oil.

Since 1911 Alberta has been known to possess oil in commercial quantities, however, until 1947, the comparatively small field of Turner Valley was the only evident sign of an oil industry in the Province. Then came Leduc, Woodbend and Redwater, followed soon after by Schoepp, Joseph Lake, Bon Accord and Stettler, all within a radius of 90 miles of Edmonton, and still the hunt for new fields goes on.

Experienced oilmen from the fields of Texas and Oklahoma, have given it as their opinion that from the Alberta-US. border to the Arctic Ocean is all potential oil territory. The phenominal success of the geological and drilling parties, who are daily striking farther north, would seem to indicate that the prediction is correct, and that Alberta will be established as one of the main oil producing areas of the world.

To illustrate the growth that has taken place over the past few years a few figures might not be amiss. In 1946 the oil industry expenditure in Alberta amounted to $12 million, in 1947 it had risen to $25 million, 1948 saw $50 million being spent, and the figure for 1949 is expected to reach $100 million.

Production of oil is hampered at the moment by lack of facilities to get the oil to refineries and markets. Despite these difficulties the week ending October 31st, 1949, saw the production of oil in the province reach 63,170 barrels per day, while the production for 1949 reached a total of 10,973,583 barrels valued at $35,127,751 and this is only the beginning. A $90,000,000 pipeline is being rushed across the Dominion, to take Alberta oil to the markets of Eastern Canada and the United States. When this has been completed the present fields will be able to go over to full production, when some more astounding figures will serve to indicate the tremendous importance of Alberta oil in the general economy of Canada.

COAL

Due to the availability of large quantities of natural gas for fuel purposes, the coal industry of Alberta, has not become so highly developed as might have been the case in other circumstances. Due also to high freight rates for long hauls to Eastern markets, Alberta coal has not been able to take full advantage of markets in areas where natural gas is not so readily available, and instead those Canadian markets have been importing large quantities of coal from the United States. There are indications that this may not be possible in the future.

However, in 1947 Alberta coal mines produced 8,074,596 tons with a valuation of $36,317,343.00, while in 1948 the production amounted to 8,111,013 tons valued at $41,875,044.00. The province is credited with possessing 48 per cent of the coal reserves of Canada.

Edmonton has several coal mines situated close to the city. They produce a domestic coal which is free burning and smokeless, and according to the Canadian classification ranks as Subbituminous B and C.

Because of difference in analysis of coals from separate points, the Edmonton area has been divided into three districts wherein similar coals occur. However, for the purpose of this publication the analysis is only shown for the chief producing district in the area.

EDMONTON DISTRICT B

Canadian Classification Subbituminous B. and C.
Typical Analysis

Proximate		**Ultimate (with 25% moisture)**	
Moisture	25.0 per cent	Carbon	51.6 per cent
Ash	6.2 " "	Hydrogen	6.2 " "
Volatile Matter	28.4 " "	Sulphur	0.3 " "
Fixed Carbon	40.4 " "	Nitrogen	1.0 " "
		Oxygen	34.7 " "
		Ash	6.2 " "

Fuel Ratio (F.C./VM). 1.40.
Calorific value, gross, in B.T.U. per lb. 8,860.
The net calorific value of this coal is approximately 570 B.T.U. per lb. lower than the gross value.

VOLUME WEIGHT RELATION

Solid Coal as in Seam

Percentage of Ash	5	10	15
Specific Gravity	1.31	1.35	1.38
Tons per hundred cubic feet	4.10	4.20	4.30
Tons per acre foot	1780	1820	1880

The following figures give an indication of the price of this coal, delivered in the City, and are subject to alteration without notice:

Slack	$3.25 per ton approximately
Stoker	$5.10 per ton approximately
Mine Run	$7.50 per ton approximately

'Within 200 miles of Edmonton on the C.N.R. lines there is available large quantities of high grade steam coal which is weather resistant and suitable for coking. The Canadian classification divides the coal into two main grades; "Medium Volatile Bituminous and High Volatile A Bituminous". Some of the mines in this district operate coal cleaning plants, and the price for mine run coal (given as an example only) is $5.62 per ton, while slack (¼ to zero screen) for coking can be obtained in large contract lots at a figure in the region of $4.00 per ton. As the whole freight rate structure is being examined at the present time by a Royal Commission, it is not possible to give any accurate estimate of the cost of transporting this coal to Edmonton. However, in cases where regular shipments are taking place the railways usually give a special commodity rate, and all the indications are that coal from this district could be laid down in Edmonton at a very economical figure.

Because of the wide differences in analysis of coals from this district three separate reports are given, one for each of the three active producers. They are as follows:—

DISTRICT A

Classification Medium Volatile Bituminous
Typical Analysis

Proximate			**Ultimate (with 1.6% moisture)**		
Moisture	1.6	per cent	Carbon	76.35	per cent
Ash	12.8	" "	Hydrogen	4.35	" "
Volatile matter	20.7	" "	Sulphur	.3	" "
Fixed Carbon	64.9	" "	Nitrogen	1.1	" "
			Oxygen	5.1	" "
			Ash	12.8	" "

Fuel ratio (FC/VM), 3.1.
Calorific value, gross, in B.T.U. per lb., 13,310.

The net calorific value of this coal is approximately 400 B.T.U. per lb. lower than the gross value.

VOLUME WEIGHT RELATION

Solid Coal as in Seam

Percentage of Ash	5	10	15
Specific Gravity	1.31	1.38	1.45
Tons per hundred cubic feet	4.10	4.30	4.50
Tons per acre foot	1780	1880	1960

DISTRICT B

Classification High Volatile A. Bituminous
Typical Analysis

Proximate			**Ultimate (with 1.8% moisture)**		
Moisture	1.8	per cent	Carbon	77.1	per cent
Ash	10.8	" "	Hydrogen	4.7	" "
Volatile matter	28.3	" "	Sulphur	0.3	" "
Fixed Carbon	59.1	" "	Nitrogen	1.1	" "
			Oxygen	6.0	" "
			Ash	10.8	" "

Fuel ratio (FC/VM), 2.1.
Calorific value, gross, in B.T.U. per lb., 13,500.
The net calorific value of this coal is approximately 430 B.T.U. per lb. lower than the gross value.

VOLUME WEIGHT RELATION

Solid Coal as in Seam

Percentage of Ash	5	10	15
Specific Gravity	1.29	1.35	1.41
Tons per hundred cubic feet	4.00	4.20	4.40
Tons per acre foot	1740	1840	1920

DISTRICT C

Classification High Volatile A. Bituminous
Typical Analysis

Proximate		**Ultimate (with 2% moisture)**	
Moisture	2.0 per cent	Carbon	75.8 per cent
Ash	10.8 " "	Hydrogen	4.8 " "
Volatile matter	26.0 " "	Sulphur	0.5 " "
Fixed Carbon	61.2 " "	Nitrogen	1.2 " "
		Oxygen	6.9 " "
		Ash	10.8 " "

Fuel ratio (FC/VM), 2.4.
Calorific value, gross, in B.T.U. per lb., 13,490.
The net calorific value of this coal is approximately 440 B.T.U. per lb. lower than the gross value.

VOLUME WEIGHT RELATION

Solid Coal as in Seam

Percentage of Ash	5	10	15
Specific Gravity	1.29	1.33	1.38
Tons per hundred cubic feet	4.00	4.15	4.30
Tons per acre foot	1740	1800	1860

ACKNOWLEDGMENT

Acknowledgment is due to the Provincial Government of Alberta for their permission to reproduce analysis reports contained in their publication "Coals of Alberta; Their Occurrence, Analysis and Utilization," prepared by Messrs. Edgar Stansfield and W. Albert Lang, published in 1944. Also to the several Coal Mining Companies which were good enough to supply general information.

THE CITY ELECTRIC LIGHT AND POWER SYSTEM

The electric light and power system operates on three voltages:

13,200	Volts
2,300	"
110/220	"

The frequency is 60 cycles.

The peak load for the city power plant at the moment is 46,000 K.W. However, plans are in hand to build this up to 70,000 K.W. The department is anxious to be of service to industry locating in the city, and feel confident that with reasonable notice they would be able to meet any special demand likely to arise in the future.

The current rates as at February 1st, 1950, for the three separate services are given below:

Industrial Power—2,300 Volt Three Phase Service, 75 K.V.A. or Over

Customer supplying all Transformers, Switching Equipment, etc., Service to be taken at 2,300 Volt, balanced three phase and having a measured maximum demand of not less than 75 K.V.A. taking a minimum consumption of 10,000 K.W. Hours per month.

First 50 Hours use of K.V.A. of demand at 1.1 cent per K.W. Hour.
Next 50 Hours use of K.V.A. of demand at 1.0 cent per K.W. Hour.
Next 100 Hours use of K.V.A. of demand at 0.9 cents per K.W. Hour.
Over 200 Hours use of K.V.A. of demand at 0.8 cents per K.W. Hour.

Plus a service charge of 50 cents per K.V.A. of demand taken at the highest 15-minute interval in any one month, and this shall be accepted as the maximum demand for the succeeding twelve months, or until a greater demand is established.

Minimum bill $136.75 per month.

Wholesale Power 13,200 Volt, 200 K.V.A. Demand or Over

Customer supplying all Transformers, Switching Equipment, etc., Service to be taken at 13,200 Volt, balanced three phase and having a measured maximum demand of not less than 200 K.V.A. taking a minimum consumption of 50,000 K.W. Hours per month.

First 25 Hours use of K.V.A. of demand at 1.1 cents per K.W. Hour.
Next 25 Hours use of K.V.A. of demand at 1.0 cents per K.W. Hour.
Next 50 Hours use of K.V.A. of demand at 0.9 cents per K.W. Hour.
Over 100 Hours use of K.V.A. of demand at 0.8 cents per K.W. Hour.

Plus a service charge of 50 cents per K.V.A. of demand taken at the highest 15-minute interval in any one month, and this shall be accepted as the maximum demand for the succeeding twelve months, or until a greater demand is established.

Minimum bill $535.00 per month.

Commercial Power 2,300 Volt Service 75 K.V.A. or Over

Customer supplying all Transformers, Switching Equipment, etc. Service to be taken at 2,300 Volt, balanced three phase and having a measured maximum demand of not less than 75 K.V.A. taking a minimum consumption of 10,000 K.W. Hours per month.

First 100 Hours use of K.V.A. of demand at 1.1 cents per K.W. Hour.
Next 100 Hours use of K.V.A. of demand at 1.0 cents per K.W. Hour.
Next 200 Hours use of K.V.A. of demand at 0.9 cents per K.W. Hour.
Over 400 Hours use of K.V.A. of demand at 0.8 cents per K.W. Hour.

Plus a Service Charge of 50 cents per K.V.A. of demand taken at the highest 15-minute interval in any one month, and this shall be accepted as the maximum demand for the succeeding twelve months, or until a greater demand is established.

Minimum bill $145.00 per month.

Three Phase Power—220 Volt

First 500 K.W. Hours at 1.2c per K.W. Hour.
Next 1,500 K.W. Hours at 1.1c per K.W. Hour.
Next 3,000 K.W. Hours at 1.0c per K.W. Hour.
Over 5,000 K.W. Hours at 0.9c per K.W. Hour.
Plus a Service Charge of 50c per H.P. connected or K.V.A. demand.

Minimum charge, first 20 H.P. connected load 75 cents per H.P. per month. All over 20 H.P. connected 50 cents per H.P. per month.

Minimum bill $2.25 per month.

Combined Wholesale Light and Power Low Voltage Network Rates

Service to be taken at 120/208 Volt, Balanced three phase four wire, and having a measured maximum demand of not less than 75 K.V.A. taking a minimum consumption of 10,000 K.W. Hours per month.

First 60 Hours use of K.V.A. of demand at 1.2c per K.W. Hour.
Next 100 Hours use of K.V.A. of demand at 1.1c per K.W. Hour.
Next 100 Hours use of K.V.A. of demand at 1.0c per K.W. Hour.
Over 260 Hours use of K.V.A. of demand at 0.9c per K.W. Hour.

Plus a Service Charge of 50 cents per K.V.A. of demand taken at the highest 15-minute interval in any one month, and this shall be accepted as the maximum demand for the succeeding twelve months, or until a greater demand is established.

Minimum bill $152.00 per month.

The City Domestic and Commercial Service operates on Single Phase 110/220 Volts, and the charges are as follows:

DOMESTIC LIGHTING

For private family use exclusively

First 40 K.W. Hours at 4 cents per K.W. Hour.
Next 110 K.W. Hours at 2 cents per K.W. Hour.
Over 150 K.W. Hours at 1½ cents per K.W. Hour.
Minimum Charge $1.00 per Month.

DOMESTIC LIGHTING AND ELECTRIC RANGE

Range of 4 K.W. Capacity or Over

First 40 K.W. Hours at 4 cents per K.W. Hour.
Next 110 K.W. Hours at 2 cents per K.W. Hour.
Over 150 K.W. Hours at 1 cent per K.W. Hour.
Minimum Charge $1.00 per Month.

ELECTRIC WATER HEATERS

Domestic Use ..... ¾ cent per K.W. Hour.
Minimum Charge $1.00 per Month.

Commercial Lighting

Commercial and Business premises, Offices, Stores, Hotels, Boarding and Rooming Houses, Apartment Houses, Multiple Dwellings. (Where subject to Department Regulations, the energy is metered on one meter.)

First 100 K.W. Hours at 4 cents per K.W. Hour.
Next 500 K.W. Hours at 3½ cents per K.W. Hour.
Over 600 K.W. Hours at 2 cents per K.W. Hour.
Minimum Charge $1.00 per Month.

Commercial Heating and Single Phase Power

First 50 Hours use, per K.W. connected at 2 cents per K.W. Hour.
Over 50 Hours use, per K.W. connected at 1½ cents per K.W. Hour.
Minimum Charge, Single Phase Motors up to 3 H.P., Heating, etc., 50 cents per K.W. Hour connected.
Minimum Charge $1.50 per Month.

Commercial Heating and Single Phase Power

First 50 Hours use, per K.W. connected at 2 cents per K.W. Hour.
Over 50 Hours use, per K.W. connected at 1½ cents per K.W. Hour.
Minimum Charge, Single Phase Motors up to 3 H.P., Heating, etc. 50 cents per K.W. Hour connected.
Minimum Charge $1.50 per Month.

SIGN LIGHTING

Three cents (3c) per K.W. Hour
Minimum Charge, 50 cents per K.W. connected
Minimum Bill $1.00 per Month
Three Phase Power — 220 Volt

First 500 K.W. Hours at 1.2 cents per K.W. Hour.
Next 1,500 K.W. Hours at 1.1 cents per K.W. Hour.
Next 3,000 K.W. Hours at 1.0 cents per K.W. Hour.
Over 5,000 K.W. Hours at 0.9 cents per K.W. Hour.
Plus a Service Charge of 50 cents per H.P. connected or K.V.A. demand.

Minimum Charge, First 20 H.P. connected load 75 cents per H.P. per month. All over 20 H.P. connected 50 cents per H.P. per month.

Minimum Bill $2.25 per Month.

Under all services there is a discount of Five Per Centum (5%) on all bills if paid within ten (10) days from date of bill.

THE CITY WATER SYSTEM

Water for use in the city is drawn from the North Saskatchewan River. The analysis of the water before and after treatment and softening are given below:

ANALYSES OF WATER FROM NORTH SASKATCHEWAN RIVER

	Winter Months Oct. to April Inclusive	Summer Months May to Sept. Inclusive	Average
Calcium Carbonate	142 p.p.m.	98 p.p.m.	120 p.p.m.
Calcium Sulphate	26 p.p.m.	Nil	13 p.p.m.
Magnesium Sulphate	86 p.p.m.	50 p.p.m.	68 p.p.m.
Magnesium Carbonate	Nil	Nil	Nil
Sodium Chloride	4 p.p.m.	4 p.p.m.	4 p.p.m.
Organic Matter	12 p.p.m.	14 p.p.m.	13 p.p.m.
Total Solids	270 p.p.m.	166 p.p.m.	218 p.p.m.
Carbonate Hardness	142 p.p.m.	98 p.p.m.	120 p.p.m.
Non-carbonate Hardness	86 p.p.m.	40 p.p.m.	63 p.p.m.
Total Hardness	228 p.p.m.	138 p.p.m.	183 p.p.m.
Alkalinity	142 p.p.m.	98 p.p.m.	120 p.p.m.
pH Value	7.9	8.1	8.0

AVERAGE WATER AS SUPPLIED AFTER TREATMENT AND SOFTENING

	Summer Months May to Sept. Inclusive	Winter Months Oct. to April Inclusive
Dry Residue	8 p.p.m.	6 p.p.m.
Sodium Chloride (NaCl)	5 p.p.m.	5 p.p.m.
Calcium Sulphate ($CaSO_4$)	6 p.p.m.	18 p.p.m.
Magnesium Sulphate ($Mg\ SO_4$)	28 p.p.m.	27 p.p.m.
Calcium Bicarbonate ($Ca(HCO_3)_2$)	52 p.p.m.	43 p.p.m.
Magnesium Bicarbonate ($Mg(HCO_3)_2$	0 p.p.m.	0 p.p.m.
Sodium Sulphate	22 p.p.m.	65 p.p.m.
Aluminum and Iron Oxide (Al_2O_3 - Fe_2O_3)	------	------
Silica (SiO_2)	------	------
Total Solids	121 p.p.m.	164 p.p.m.
Total Hardness	73 p.p.m.	73 p.p.m.
pH Value	8.7	8.6
Bacteria Count, per Cubic Centimeter	3	3
Bacteria Coli	Nil	Nil

Waterworks Tariff

All rates subject to 5% discount except as noted, if paid within ten days of date of bill.

The rates charged for water consumed as shown on page 24, are effective as at February 1st, 1950.

METERED SERVICES

				Rate per 100 cu. ft.	Min. Charge Per Month
From	0	to	800 cu. ft.	31c	$ 1.12
"	800	to	1,800 cu. ft.	28c	2.48
"	1,800	to	4,000 cu. ft.	26c	5.04
"	4,000	to	7,000 cu. ft.	23c	10.40
"	7,000	to	13,600 cu ft.	21c	16.10
"	13,600	to	21,000 cu. ft.	19c	28.56
"	21,000	to	28,000 cu. ft.	18c	39.90
"	28,000	to	36,000 cu. ft.	16½c	50.40
"	36,000	to	100,000 cu. ft.	15½c	59.40
"	100,000	to	500,000 cu. ft.	14½c	155.00
"	500,000	to	1,500,000 cu. ft.	13½c	725.00
"	1,500,000	to	3,000,000 cu. ft.	12¼c	2,025.00
"	3,000,000	cu. ft. upwards		11c	3,675.00

These minimums apply irrespective of consumption.

BITUMINOUS SANDS

The story of Alberta's oil wealth has now become legendary, but little is known about the vast deposits of bituminous sands that lie in the vicinity of McMurray, a small town, some 350 miles north of Edmonton. These sands may provide the answer to the world's search for oil, as they are estimated by the United States Bureau of Mines to contain 250,000 million barrels of crude oil, or more than ten times the proven oil reserves of all the oil fields in the world.

The difficulty in the past has been to separate the oil from the sand at a figure likely to be economical for commercial development purposes. However, for some time the Government of Alberta has been operating a plant, on experimental lines, to determine whether the proposition is likely to have commercial significance. So far the experiments give cause for optimism and it will be known in 1950 whether or not the crude oil produced at the plant, can compete on the market with other crude oils.

One might naturally ask whether the discovery of oil at the fabulous fields of Leduc and Redwater have lessened the commercial prospects of the oilsands? American oil officials have expressed the opinion that, if anything, the discoveries of oil in the various fields around Edmonton, have brightened the prospects of the oilsands. This is based on the fact that required pipelines are now being proceeded with. In order to get the crude oil from the oilsands plant to a marketing centre like Edmonton it will be necessary to pipe it. The present network of pipelines being laid will greatly facilitate this.

The oil sands extend over an area of 1,200 square miles, and it has been found that the depth of oil bearing sand is 150 to 200 feet in thickness. The sand contains 12 to 17 per cent bitumen by weight at a specific gravity of 1.015. One ton of sand therefore contains 24-34 Imperial gallons of oil.

Even assuming very conservatively that the depth of oil bearing sand is only five feet in thickness it can be quickly calculated that this area contains billions of barrels of oil.

The plant, for experimental purposes, produces some 250 barrels of crude oil per day which is piped to the plant's own refinery nearby. From this crude oil are produced naphtha, distillate, diesel oil, light fuel oil, and heavy bunker fuel.

The extraction of oil from the sand is achieved by the hot water process. The sand is scooped up from outside the plant by mechanical means, and loaded into a hopper. It is then steamed to fluidize the sand. Hot water is then added to bring it to 12 per cent moisture by weight, the hot water circulating through the separation plant at the rate of 400 gallons per minute. The original substance leaves the plant as two products, crude oil and

clean sand. The oil goes to the refinery, the sand is dumped. An interesting feature about this sand is that it has a high silica content, and is therefore suitable for use as a glass sand.

If the present experiments prove that the oil can be extracted from the sands at a commercially economical figure, it will mean that present world consumption of oil can be supplied from this one source for the next three hundred years.

Edmonton is the refinery centre for the oil producing areas of Alberta, and the phenomenal discoveries of oil being made will add greatly to the importance of the City as an industrial focal point.

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ACKNOWLEDGMENT

Acknowledgment is due to the Research Council for the University of Alberta, and to the Department of Economic Affairs, Government of Alberta, for information contained in this section.

FUTURE FOR THE GLASS INDUSTRY IN EDMONTON

As cheap fuel is a basic factor in the establishment of a glass industry, Edmonton, with its labour facilities, transportation network, and abundance of natural gas, offers some interesting possibilities in this direction. Thanks to the efforts of the Research Council of Alberta, and various members of their staff, there has recently been discovered sizeable quantities of high grade glass sands within eleven miles of the Northern Alberta Railway at Peace River, some 317 miles north of Edmonton.

These sands run high enough in Silica—98.8 per cent—after beneficiation by magnetic separation and tabling to be classified as high grade glass sands. It is estimated that the Peace River deposits referred to contain in excess of 1,000,000 tons.

Such sand could be transported to Edmonton, and other parts, at a figure that would assure effective competition with glass sands at present being imported from Illinois. With the whole matter of freight rates at present being considered by a Royal Commission on Transportation, it is not possible to quote firm rates for a haul of this nature. However, as a guide, in 1948 certain members of the Research Council of Alberta went into the question of what it would cost to haul Peace River silica sands, to certain points. The rates they were quoted are as follows:—

Freight Rates on Sand from Peace River

Peace River to Edmonton	$2.20 per ton
Peace River to Calgary	$3.00 per ton
Peace River to Medicine Hat	$3.50 per ton
Peace River to Vancouver	$7.00 per ton

These are calculated rates based on mileage and class of freight. It must be noted that no shipments of the sand were made over these routes, and it is quite possible that if regular shipments were to be made, the railway might be prepared to offer a lower commodity rate. Anyone interested in this matter should apply direct to the Freight Agent C.P.R. or C.N.R., Edmonton, Alberta, for firm rates.

As a comparison, the following estimated freight rates on sand imported from Illinois are worthy of note. These rates were estimated in 1948:—

Estimated Freight Rates on Illinois Sand

Illinois to Edmonton	$9.60 per ton
Illinois to Calgary	$8.80 per ton
Illinois to Medicine Hat	$8.30 per ton
Illinois to Vancouver	$11.80 per ton

At the present time the consumption of glass sand in Alberta runs between 10,000 and 15,000 tons annually, while the output of pressed, blown and drawn glass of all kinds in Canada was

valued at $17,500,000 in 1946. Imports of window glass in that year totalled 43,700,000 sq. ft. valued at $2,700,000.00.

The new deposits at Peace River, and the very valuable saving in freight offers unusual possibilities for enlarging the industry in Alberta, and entering the export trade.

From the foregoing it would appear that if the sand can be produced at Peace River for between $3.00 and $4.00 per ton, it would compete very favourably with imported sand having an estimated cost of $2.00 per ton in Illinois.

The report of Mr. M. B. B. Crockford, on "Geology of Peace River Glass Sands Deposit", should be referred to for greater detail. Some of his conclusions may be of interest, and together with certain of his analysis reports, are given below in their entirety.

SUMMARY AND CONCLUSIONS
from
MR. M. B. B. CROCKFORD'S REPORT FOR THE RESEARCH COUNCIL OF ALBERTA ON "GEOLOGY OF PEACE RIVER GLASS SAND DEPOSITS"

1. A glass sand occurs in the uppermost 40 to 60 feet of the Peace River formation along the banks of the Peace River. . . . Of the foregoing thicknesses, about 60 per cent is a glass sand.
2. Four samples of the sand were tested, and all will yield a product having a size and distribution suitable for glass making.
3. All samples except Sample 1 lend themselves to Wilfley table beneficiation, and will yield a silica sand product of suitable chemical composition for glass making.
4. The glass sand was beneficiated at a loss of 40 to 50 per cent of the raw material. In actual practise this loss could probably be reduced to 30 to 40 per cent.
5. The amount of available glass sand appears large enough to attract development, for it may exceed 1,000,000 tons. Accurate estimate of reserves cannot be made without test drilling since the deposit is concealed in many places.
6. The glass sand occurs in the upper part of a sandstone cliff 50 to 100 feet high in many places. Hence the overburden and waste material could be easily disposed of by dumping them over the cliff.
7. The overburden is 25 feet or more thick, and economic recovery of the sand would in most instances require the judicious location of sand pits.
8. Water for beneficiating the sand would be available at all times of the year in the nearby Peace River. . . .

9. Transportation to the Railway town of Peace River may be accomplished by river barge or motor truck. The distance by barge is about seven miles and by truck ten miles. Another alternative is that the beneficiated sand could be stockpiled at the plant during summer, and trucked over the ice in winter to Peace River.

10. Whereas this sand may be used primarily for making glass, there are other uses which might expand the market. Some of these are:

    Manufacture of asbestos shingles and asbestos pavement; the manufacture of silica brick used to line furnaces; sand for cuspidor and waste receptacles used in some public buildings; engine sand to give traction to locomotives; filter sand to remove foreign matter from water reservoirs; horticultural sand used in experiment with plants; moulding sand used in making castings of steel, iron, brass, aluminum, etc., sand for paint manufacture; blast sand for cleaning or dulling hard surfaces; sand and flint for pottery manufacture; sand for poultry and bird grit; and sand for sand tables and sand piles.

ANALYSES FROM MR. M. B. B. CROCKFORD'S REPORT for the RESEARCH COUNCIL OF ALBERTA ON "GEOLOGY OF PEACE RIVER GLASS SAND DEPOSITS"

As the analyses of the glass sands, found in the Peace River district of Alberta, may be of interest to those engaged in processing sand for various purposes they are included here, and have been taken intact from the above-mentioned report.

SIZE ANALYSES OF ORIGINAL SAMPLES

Table 2.

Field Sample		+ 20 Mesh	— 20 Mesh
		Weight %	
Sample	1	12.0	88.0
Sample	2A	23.9	76.1
Sample	2B	17.6	82.4
Sample	3	48.0	52.0

The report states that: "The oversize fraction (+20 mesh) consists of large grains and lumps and would be discarded. The abnormal percentage of oversize material in Sample 3 is largely due to the presence of lumps of sand in which the cementing material is sap from the roots of trees. This condition is local and the normal percentage waste will probably not exceed 20 per cent."

The report goes on to say that the —20 mesh fractions of the samples were screened for grain size distribution. The result of this screening is as follows:

SIZE ANALYSES OF — 20 MESH ORIGINAL FEED

Table 3.

Sample	1	2A	2B	3
% of total	88.0	76.1	82.4	52
Mesh	Weight %	Weight %	Weight %	Weight %
+ 28	5.0	10.2	14.2	12.4
+ 35	13.6	13.6	18.1	25.9
+ 48	34.8	22.4	40.5	34.0
+ 65	17.9	31.4	18.5	18.6
+100	18.3	15.3	5.3	6.3
+150	8.9	6.6	2.4	2.3
+200	0.9	0.3	0.7	0.3
—200	0.6	0.2	0.3	0.2
	100.0	100.0	100.0	100.0

The report draws attention to the fact that the above analyses shows that "The grain size requirements of a glass sand can be met in all the above samples with a minimum of loss. Since about 50 per cent of a glass sand should be around 40 mesh, the addition of the +35 and +48 mesh fractions gives approximately this amount. All the samples contain from one to eight per cent of sand too fine for use; that is, the amount by which the sum of those fractions smaller than 100 mesh exceeds the allowable maximum of two per cent. . . ."

Chemical analyses of samples is given as follows:

ASSAY OF ORIGINAL —20 MESH FEED

Table 4.

Sample No.	% Assay								
	SiO_2	Fe_2O_3	Al_2O_3	TiO_2	CaO	MgO	Na_2O	K_2O	Total
1	98.50	0.252	0.65	0.047	0.06	Tr	0.17	0.14	99.819
2A	91.11	0.111	0.97	0.036	0.05	Tr	0.15	0.34	99.767
2B	98.39	0.147	0.69	0.110	0.03	Tr	0.15	0.22	99.737
3	98.47	0.103	0.82	0.064	0.02	Tr	0.18	0.22	99.877

In order to reduce the amount of iron in the sand, cuts of the samples were tabled on a Wilfley table under a variety of conditions. By this procedure, the proportions of iron and titanium were reduced by one-half to one-third. The best results obtained in these tests are set forth as follows:

WILFLEY TABLE PRODUCTS FROM VARIOUS TESTS

Table 5.

Sample No.	Wt. % of —20 Mesh	Wt. % of Total Feed	% Assay	
			Fe_2O_3	TiO_2
1	69.0	60.6	0.123	0.029
2A	64.4	49.0	0.077	0.025
2B	73.7	60.7	0.048	0.028
3	52.2	27.2	0.062	0.038

In the following table may be determinted the percentages of sand too fine-grained to be used, and the screen analyses of the table products represented by column 3 in the foregoing table are also given.

SIZE ANALYSIS OF TABLE PRODUCTS

Table 6.

Mesh	Sample 1	Sample 2A	Sample 2B	Sample 3
	Weight %	Weight %	Weight %	Weight %
— 20				
+ 28	1.7	10.3	4.3	9.3
+ 35	13.6	16.4	18.4	34.3
+ 48	33.1	26.0	47.0	41.6
+ 65	25.5	31.2	18.5	11.2
+100	15.9	13.9	8.1	2.6
+150	9.3	2.0	2.7	0.5
+200	0.6	0.1	0.6	0.4
—200	0.3	0.1	0.4	0.1
	100.0	100.0	100.0	100.0

Table 1 was left out as it did not apply to the needs of this publication.

ACKNOWLEDGMENT

Acknowledgment is due to the very great assistance rendered by the Research Council of Alberta, and to the report of Mr. M. B. B. Crockford, and to the many other persons who were kind enough to supply the material from which this section was prepared.

A FUTURE FOR THE LEATHER INDUSTRY IN EDMONTON

The leather industry is, in the first place, dependent upon the tanneries for the leather with which to fabricate its products. To a large extent the economical production of leather products depends upon a plentiful supply of tanned hides being available at the right price. The ideal, therefore, is to have the source of supply of the raw material, in this case hides, available in close proximity to the tanneries, which in turn are close to the fabricating and processing industries.

Into these requirements Edmonton fits quite naturally. As a focal point for transportation, it is possible to make it an easy collecting centre for hides produced in the Province. Of the total supply of raw hides used in Canada, Alberta produces, roughly, 18 per cent, of these some 5 per cent, or ½ of one per cent of the total Dominion production are tanned in the Province at the present time.

This means that at the moment most of the hides produced in Alberta are being shipped to Eastern Canada, processed into leather goods, and then sent back again. This involves a very expensive haul, which could be avoided if the processing and fabricating sections of the industry were located in Edmonton. This contention can be supported by the fact that the freight rate on raw hides is higher than that on tanned hides.

The tanning side of the leather industry requires certain facilities to enable it to produce leather for fabrication at an economical cost; a few of the more important being as follows:

1. Plentiful supply of raw hides.
2. A number of important chemicals such as salt, lime and sugar.
3. Water, power and space.

These raw materials and necessary facilities can be obtained in Edmonton, very economically, and the city offers unrivaled opportunity for the establishment of this industry.

The importance of the leather industry in relation to Canada's economy warrants very serious consideration being given to the possibilities of its further development in Alberta, where all indications suggest that production costs would be lower, and the finished products more competitive in world markets.

The gross value of products such as boots, shoes and leather produced in Canada in 1946 was approximately $96,435,251, and, as already stated, a very large proportion of the hides from which these products were fabricated came from the West.

Figures from the Dominion Bureau of Statistics indicate that the tanning process approximately doubles the value of the hides, while fabrication into leather goods such as shoes, bags, etc., again doubles the value of the tanned leather. With the growth of population and industry in the West, the establishment of the leather industry offers distinct possibilities, as a good local market would be assured.

ACKNOWLEDGMENT

Acknowledgment is due to the Research Council of Alberta, and to the Dominion Bureau of Statistics, from which some of the information compiled in this section was obtained.

FUTURE FOR THE ALKALI INDUSTRY IN EDMONTON

With natural gas, coal, and oil in large quantities, Alberta is destined to become the centre of an important chemical industry. In this development, Edmonton, because of its situation in relationship to raw materials and other necessary factors, will play a large and ever-increasing part.

An extremely important branch of the chemical industry is that covered by the production of Alkali Products, and the opportunities that exist for development of this branch of the chemical industry are now better than ever before.

With the exploration for oil, vast deposits of rock salt have been found in east central Alberta. These deposits appear to be widespread, the salt beds having been encountered in drilling operations over an area of some 400 miles in length by 125 miles in width.

In his report on "Occurances of Common Salt in Alberta" Mr. M. B. B. Crockford draws attention to the interesting fact that relatively little potash has as yet been found in the salt beds. He states: "The potash could have been removed by solution after deposition, or the centre of the basin may have shifted while the potash was still in liquid state." The latter explanation has interesting possibilities for, if true, the main body of potash still awaits discovery.

The salt beds have been found at varying depths beneath the surface, some as little as 700 feet, while their thickness has been reported as being from 24 feet to 972 feet. They are situated within easy access of Edmonton.

For the establishment of an Alkali industry, there can be made available in Edmonton large quantities of common salt, limestone, coal and natural gas, and cheap electric power. With these facilities can be produced such items as: Soda ash, caustic soda, chlorine, sodium bi-carbonate, sodium silicate, sodium sulphate, and many other by-products of lesser importance which spring from the development of a chemical industry.

Four important requisites in the establishment of any industry are: Raw materials, transportation, labour and markets. Of these, Edmonton can easily look after the first three, as far as the alkali industry is concerned. The fourth, that of markets, requires some consideration. In this regard, the present trend shows an increased demand for almost all alkali products, and the possibilities could be described as world-wide.

Since 1939 the annual consumption of alkali products in Canada has almost trebled in volume and, although production

has increased, imports have also had to be increased. In 1939 approximately 10,000 tons of caustic soda, 5,000 tons of soda ash and 500 tons of sodium bi-carbonate were imported. In 1947 over 10,000 tons each of soda ash and sodium bi-carbonate and about 30,000 tons of caustic soda were imported largely from the U.S.A. In 1938 Alberta produced 4,045 tons of salt, and in 1948 this had risen to 34,329 tons. At the same time, Canadian production increased from 440,045 tons valued at $1,912,913.00 in 1938; to 728,545 tons in 1947 valued at $4,436,930.00. And the demand is still increasing.

It is interesting to note that in the United States, since the end of the war, the increased production of alkalis has not been able to keep up with the increased use, and still further increased demand. This trend also seems to apply to chlorine. In view of this it is more than ever necessary for Canada to step up her own production of these materials so as to ensure that she can meet her own domestic needs.

If due consideration is given to the possibility of establishing an export trade, via the west coast ports, it is highly probable that considerable impetus could be given the new industry by developing it with this in mind. The results of the present deliberations going on before the Royal Commission on Transportation will have a great affect on the development of industry in the West, and it is quite possible that the export trade may get assistance from the final decisions arising out of the inquiry.

ANALYSIS OF SALT FROM AN ALBERTA SALT BED

In his report on "Occurances of Common Salt in Alberta" Mr. M. B. B. Crockford gives the following analysis of salt obtained from a bed 446 feet thick. The salt is recovered in the form of solution, utilizing the water from a river nearby.

The raw brine as pumped from the well produced the following analysis:

	Per cent
Ca ++	0.109
Mg ++	0.285
Al +++	nil
Fe ++	nil
SO_4=	0.166
CO_3=	0.060
Water	73.820
NaCl by difference	23.560
	100.00

Mr. Crockford's report states: "No tests were made on the brine for potassium or phosphoric salts. The water as it comes out of the well is 98.8 per cent saturated, and contains by weight 23.56 per cent common salt. Since the river water used contains some dissolved salts, part of the impurities shown in the above analysis come from this source."

ACKNOWLEDGMENT

Acknowledgment is due to the Research Council of Alberta, and to Mr. M. B. B. Crockford, for use of his report, "Occurances of Common Salt in Alberta," from which the information in this section was obtained.

INDUSTRIAL SITES

Despite the phenomenal growth of the city over the past three or four years, Edmonton still has a number of very desirable sites suitable for a variety of industrial needs. Some have railway trackage adjacent to the property; all have city services of light, power, water and sewerage, and natural gas is also available.

In keeping with the progressive outlook of the city's administration, the services have lately been obtained of a very highly experienced town planner. Under his direction, Edmonton is being carefully planned to assume its role of a leading metropolis in Canada's growth and expansion.

Any industry coming to Edmonton and requiring special facilities will find the city ready and anxious to accommodate it. Should it be necessary, the city is prepared to consider favorably the extension of services to any suitable site within the city limits.

At the moment, practically every industrial area within the city is served by the city transportation services, and residential districts are within easy reach for those employed in the various areas.

A limited amount of covered and fully serviced space is available on a rental basis; for full details as to this and all other matters relating to premises or sites for industrial purposes, application should be made to the Industrial Commissioner for the City of Edmonton, Civic Block, Edmonton, Alberta.

HOUSING AND CONSTRUCTION

As is the case in most growing cities, housing is something of a problem in Edmonton at the present time. However, rapid strides are being made to combat the shortage, and signs are visible that the efforts are meeting with success.

There are only a few subsidized houses for rental in the city. Houses for rent are scarce and average from $50.00 per month up, depending on size and location.

Family-type houses are available for purchase from $5,000 up to $15,000, again depending upon size and location. Most of the houses can be purchased by a down payment of from 20 per cent up.

Suites in apartment blocks are now becoming more easily obtainable at rentals of from $70.00 per month up, depending on size. The rental usually includes certain services such as heating, etc.

All the signs point to a very extensive construction programme taking place in Edmonton during 1950.

In 1948 Building Permits amounted to $27,123,329 while in 1949 they increased to $40,050,063. It is estimated that some 20,000 persons will, directly or indirectly, be employed to put the 1950 programme into effect.

Among the projects scheduled for commencement in 1950 are the following:

Oil Refinery	$10,000,000
Oil Refinery	8,000,000
Macdonald Hotel Extension	5,000,000
City Churches, various projects	3,500,000
Department Store Programmes	4,000,000
Housing, General	25,000,000

The foregoing gives some indication of the magnitude of the expansion of Edmonton in the immediate future. It is probably true to say that the activity in general construction will continue for some years to come. As matters now stand, it would appear that the city will have the greatest per capita construction programme on the North American continent in 1950.

RAILWAYS

The City of Edmonton is situated on the transcontinental line of the Canadian National Railway, connecting Eastern Canada with the Pacific Coast. In addition, it is the terminus of the Northern Alberta Railway, which serves part of the tremendous territory to the north. The city is also connected to the Canadian Pacific Railway's Transcontinental line, which runs through Calgary, by means of the Edmonton-Calgary branch of the Canadian Pacific Railway.

As an example of Edmonton's importance as a rail centre, may be stated the fact that in October, 1949, the Canadian National Railways alone received and dispatched 82,000 freight cars. This is not surprising when it is taken into account that Edmonton is the distribution centre for some 100,000 square miles of thriving territory.

By means of rail transportation, frequent and reliable connections may be made with points in Eastern Canada, the West Coast, United States of America, and by combined rail and road to the North West Territories, the Yukon and Alaska.

At the present time, a Royal Commission is inquiring into the whole structure of transportation and freight rates. In its submission to the Commission, the Canadian Pacific Railway Company has pointed out that transportation rates generally are much less in Canada than in the United States, and gave as examples the fact that automobiles can be transported from Eastern to Western Canada at a much lower rate than from Eastern United States plants to the United States Pacific Coast, and that lumber from Canada's West Coast can be moved to Eastern Canada more economically than for a comparable haul in the United States.

This point of view is interesting because of the opinion held, in some quarters, that the cost of transportation has been a deterrent in the industrial development of Western Canada. It has not held back the industrial development of the Western United States, and there is plenty of evidence to suggest that Western Canada will develop industrially despite the question of freight rates or any adjustments that might be made as a result of the Royal Commission's findings.

AIR TRANSPORTATION

Edmonton has earned the name of "Crossroads of the World" because of its importance as an air centre. During 1949 between eighty and ninety thousand landings and take-offs were accomplished without mishap.

From Edmonton's airport regular daily scheduled flights are possible to Eastern Canada and the United States, and also to the West Coast and the Far East.

Some idea of the convenience of Edmonton as an air transportation centre can be obtained from the following:

Time taken from Edmonton to reach—	
Bermuda	27 hours
Glasgow	37 "
Hamburg	48 "
London	40 "
Madrid	68 "
Montreal	12 "
New York	14 "
Ottawa	11 "
Paris	44 "
Rome	59 "
Sydney	54 "
Tokio	30 "
Toronto	8 "
Vancouver	3 "

A regular service is available to the North West Territories and main intermediate points; and also to the Middle Western United States. In addition, several charter companies operate from Edmonton, serving the north and elsewhere.

Few places in the world can claim to be so excellently served by air transportation facilities as the City of Edmonton, and there is no doubt that these facilities will become even greater as the economy and industrial expansion of the city demands.

ROAD COMMUNICATION

Edmonton is the focal point for a veritable network of roads serving the whole Province of Alberta.

All-weather roads insure that freight from the city can move to parts not served by the railway, particularly the rich mining areas of the North West Territories immediately adjacent to Alberta's northern boundary.

In the near future roads will play a big part in the opening-up and development of the northern parts of Western Canada. The Alaska Highway which commences just north of Edmonton, and continues through the rich Peace River country, the Yukon and on into Alaska has done much to open up a large part of Northwestern Alberta and Northern British Columbia. From this all-weather highway loops have been run into the surrounding territory and the volume of traffic in and out of the area served by the Alaska Highway has increased tremendously over the past few years.

The ever-growing mining and fishing industries of the north rely in the main on road communications for their freight and to ship their production to markets.

The fishing industry, for instance, is becoming increasingly important and regular shipments are being made to markets in New York and Chicago.

In the years ahead the North West Territories may well become the largest producer of base metals in the world. Road transportation will naturally play a big part in this development initially.

The Provincial Government has a large highway improvement plan in hand, and the condition of the roads in the remote parts can be expected to improve.

The movement of freight by highway transportation is in the hands of several haulage companies having depots in Edmonton. They are ready and anxious to supply any information concerning schedules and charges.

EDMONTON CITY TRANSPORTATION SERVICE

The transportation services have managed to keep up to the increased demand for public transportation occasioned by the rapid growth of the city.

Practically every residential and industrial centre is served by gasoline or electric trolley bus, and as rapidly as possible the latter are being installed on all major routes to still further improve the service.

During the winter months all buses are heated and maximum comfort is assured to the passengers. No one coming to reside within the city limits need have any fears about being able to travel quickly between his residence and his work.

LABOUR LEGISLATION

Labour legislation in Canada is, for the most part, dealt with by the individual provinces, as it usually governs, in some respect, the contract of service between employer and employee.

The right to contract is a civil right, and the British North America Act, which distributes legislative powers between the Parliament of Canada and the Provincial Legislatures, grants to the provinces power to enact laws in relation to civil "rights", and, with certain exceptions, "local works and undertakings".

In Alberta, the Board of Industrial Relations, under the Provincial Government Minister of Industries and Labour, is responsible for the administration of the labour laws within the province. It is concerned with wages, hours and labour welfare, while the Department of Public Works looks after the factory regulations. Legislation for the protection of miners is dealt with by the Department of Mines and Minerals.

Factory and shop legislation prohibits child labour and regulates the hours of women and young persons, and provides for safety and health.

The Alberta Labour Act consolidates, with some changes, the Hours of Work Act, the Male and Female Minimum Wage Acts, the Labour Welfare Act and the Industrial Conciliation and Arbitration Act. It applies to all employees except farm labourers and domestic servants.

Under the Act the Board of Industrial Relations is empowered to arbitrate a dispute between an employer and employees over wages, hours and conditions of employment, and to make special orders requiring employers to give holidays with pay to persons whose employment is seasonal or intermittent. Provision is made for disputes in the coal mining industry to be dealt with under the Federal legislation instead of under the Act.

A copy of the Act may be obtained from the Board of Industrial Relations, Legislative Buildings, Edmonton, Alberta.

AVAILABILITY OF MALE LABOUR

The general availability of labour in Edmonton is good, and industries should not experience any undue difficulty in obtaining their labour requirements.

The Government National Employment Service is linked in across the whole Dominion and can, therefore, draw on other cities and provinces for any requirements. During 1949 the Edmonton office achieved 29,600 placements.

Technical and executive posts can be filled through the Executive and Professional Division of the Employment Service,

which works through all the various branches and has headquarters in Ottawa.

In addition, Edmonton as a university city has every opportunity of obtaining graduates on completion of their courses: 1950 will see the University of Alberta graduate the largest engineering class in its history.

Skilled and unskilled labour may be obtained in a variety of different trades, and specific requirements should be submitted to the National Employment Service in Edmonton, which is in a position to give the most up-to-date information on labour availability.

Some indication of agreed current wage rates in force during January, 1950, for standard 8-hour day, 44-hour week, may be obtained from the following list:

SCHEDULE OF WAGES AND WORKING DAY HOURS

Trade or Class of Labour	Rate of Wages Not Less Than Per Hour	Hours of Labour Not More Than Per Day	Per Week
Blacksmiths	$1.25	8	44
Blacksmiths' helpers	1.00	"	"
Brick and hollows tile layers	1.80	"	"
Brick and hollow tile layers' helpers (mixing and tempering mortar)	1.05		
Carpenters and joiners	1.47½	"	"
Cement finishers	1.20	"	"
Cement and concrete mixer operators:			
Steam—	1.05	"	"
Gas or electric—	1.00		
Compressor operators (gas or electric)	1.00		
Dragline operators (steam or gas)	1.25	"	"
Dragline firemen	1.00		
Dragline oilers	1.00	"	"
Drivers	.95		
Driver, team and wagon	1.35		
Drill runners	1.05	"	"
Electricians (inside wiremen)	1.60		
Engineers, operating, steam:			
Single drum—	1.00	"	"
Double drum—	1.25		
Engineers on steel erection	1.47½	"	"
Firemen, stationary	1.00		
Hoist operators—tower (gas or electric)	1.00	"	"
Labourers	.95		
Linoleum layers	1.00	"	"
Mastic floor layers	1.10		
Mastic floor rubbers and finishers	1.05	"	"
Mastic floor kettlemen	1.00		
Motor truck drivers	1.00	"	"
Motor truck driver and truck	2.00		
Ornamental iron workers	1.30	"	"
Painters (spray)	1.25		
Painters and glaziers	1.25	"	"
Pipefitters (surface—temp. work)	1.00		
Pipe layers, calkers and solderers	1.00	"	"
Plumbers and steamfitters	1.60		

Trade or Class of Labour	Rate of Wages Not Less Than Per Hour	Hours of Labour Not More Than Per Day	Per Week
Plumbers and steamfitters' helpers, (all men assigned to help tradesmen)	1.00	"	"
Road grader operators (gas)	1.10		
Road roller operators (steam or gas)	1.05	"	"
Rodmen (reinforced steel)	1.10		
Roofers:			
Felt & gravel; patent; composition—	1.00	"	"
Sheet metal—	1.55		
Sheet Metal workers	1.55	"	"
Steam shovel engineers	1.25		
Steam shovel firemen	1.00	"	"
Steam shovel oilers	1.00		
Shovel operator (gas)	1.25	"	"
Structural steel workers	1.47½		
Tile setters:			
Asphalt—	1.10	"	"
Ceramic—	1.75		
Tile setters' helpers (all men assigned to help tradesmen)	1.00	"	"
Tractor operators:			
Letourneau, etc.—	1.10	"	"
Small—	1.00		
Watchmen	.75	"	"
Journeyman welder:			
Electric and Acetylene—	1.32	"	"
On steel erection—	1.47½		
Machinist Journeyman Tool and Die-makers	1.25 - 1.35		
Operators:			
Milling, boring and shaper	1.25	"	"
General lathe	1.10 - 1.25		
Press grinders, filers, etc.	1.10	"	"

AVAILABILITY OF FEMALE LABOUR

The position so far as female labour is concerned closely follows that of male labour in that, through the National Employment Service, most ordinary requirements can be met.

Experienced office staff as at January, 1950, are being paid the following rates per month for a 44-hour week. However, the conception of a 40-hour week is becoming popular, and may become the standard office week of the future:

	Per Month
Secretary standard, shorthand and typing	$140 - 165
Clerks with experience	100 - 125
Junior stenographers	100 - 120
Typists (no shorthand)	100 - 120

Female factory employees generally work on piece rates and average around $25.00 per week.

UNEMPLOYMENT INSURANCE

This Act came into force on 1st July, 1941, and it applies to all employed persons, with the following exceptions:

Workers in specified industries or occupations such as agriculture, forestry, fishing, lumbering and logging, private domestic service, private duty nursing, certain director-officers' of corporations, workers on rates other than hourly, daily or piece rates if earning more than $3,120 per year, and employment in a hospital or charitable institution not carried on for gain.

All employees paid by the hour, day or on piece rate (including a mileage rate) are insured regardless of amount of earnings, together with all employees who receive $3,120 or less per year under weekly, monthly or yearly rates.

Both employer and employee contribute to the fund, the total paid by each group being approximately equal.

The Federal Government contributes an amount equal to one-fifth of the combined employer-employee contribution, and also assumes the cost of administration.

WEEKLY RATES OF CONTRIBUTION AND BENEFIT UNDER THE UNEMPLOYMENT INSURANCE ACT

*4		*1		*2	*3	
CLASS	Earnings in Week	Weekly Contributions by Employee	by Employer	Denomination of Stamp	Weekly Benefits Single Person	Person with 1 or more Dependents
0	less than .90c a day or under 16 years of age.	.18c paid on his behalf by employer		.18c		
1	$ 5.40 - $ 7.49	.18c	.12c	.30c	$ 4.20	$ 4.80
2	7.50 - 9.59	.24c	.15c	.39c	5.10	6.30
3	9.60 - 11.99	.24c	.18c	.42c	6.00	7.50
4	12.00 - 14.99	.24c	.21c	.45c	7.20	9.00
5	15.00 - 19.99	.24c	.24c	.48c	8.10	10.20
6	20.00 - 25.99	.30c	.30c	.60c	10.20	12.90
7	26.00 - 33.99	.36c	.36c	.72c	12.30	15.60
8	34.00 - or more	.42c	.42c	.84c	14.40	18.30

1. The daily rate of contribution in respect of each class is one-sixth of the weekly rates.
2. Unemployment insurance stamps combine both employer and employee contributions.
3. Rates calculated on assumption that the person is in the same class for the last 180 days in the two years preceding the claim. Daily benefit for an insured person without dependents is 34 times the average of his 180 most recent daily contributions, and 45 times the average daily

contribution, less ten cents per day in the case of a person mainly or wholly maintaining one or more dependents. The daily rate is one-sixth of the weekly rate.

4. Workers in this class make no contributions (the contributions being wholly borne by the employer), and are not eligible for benefit. They may, however, accumulate benefit rights on the basis of the employer contributions.

No benefit is payable during the first nine days of unemployment in a benefit year. After that time, the duration of benefit is related to the employment and contribution history of the employee, the number of days' benefit being equal to one-fifth the number of contribution days during the previous five years, less one-third of the number of benefit days in the previous three years. Insurance benefit is paid as a right on fulfilment of four statutory conditions:

1. The payment of not less than thirty weekly or 180 daily contributions within two years, while in insured employment: The two-year period may be extended in certain circumstances.
2. Not more than 50 per cent of contributions within one year preceding the claim being at the lowest rate specified in the Second Schedule.
3. Proper presentation of claim.
4. Claimant being at least 16 years of age.

APPRENTICE TRAINING

"Apprenticeship acts are in force in all provinces and agreements for Federal assistance are in effect in Alberta. During 1947 several additional trades were brought within the acts. Considerable impetus to apprentice training was given by the large number of veterans who entered various designated trades. The number of non-veteran apprentices also increased rapidly and the supervision of apprentice training improved."

TRAINING OF UNEMPLOYED PERSONS

"Agreements completed in 1945 between the Dominion and certain provinces provided for the training or retraining of workers who had been released from employment. Under these agreements, the Dominion undertook to pay approximately 75 per cent of the cost of training workers selected by representatives of the Provincial Governments, and the National Employment Service."

ORGANIZED LABOUR IN CANADA

"At the close of 1946 there were 831,697 trade union members in Canada. The membership of the T.L.C. (Trades and Labour Congress of Canada) as compiled from reports of unions to the Department of Labour was 356,121 in 2,536 branches of

affiliated and directly chartered unions; that of the C.C.L. (Canadian Congress of Labour) was 314,025 in 1,087 branches and local unions; that of the Canadian and Catholic Confederation of Labour 70,367 in 388 branches; the independent railroad brotherhoods 37,731 in 370 branches; and independent local unions 4,298 in 47 branches."

"The Trades and Labour Congress of Canada is the oldest of the central labour organizations. Affiliated with the Trades and Labour Congress at the present time are 'international' trade unions, almost all of which are also affiliated with the A.F. of L. (American Federation of Labour), a number of Canadian or 'national' unions and a number of directly chartered labour unions."

"Canadian Congress of Labour was organized in 1940 when the all Canadian Congress of Labour, formed in 1927, amended its constitution to permit the affiliation with the Congress of the Canadian branches of those international unions which, in the United States, are affiliated with the Congress of Industrial Organizations. The Canadian Congress has also among its members a number of unions to which it has granted charters."

"The Canadian and Catholic Confederation of Labour dates from 1901. In 1921 these local Catholic Syndicates, which are grouped federations according to industry as far as possible, formed a central organization, the Canadian Catholic Confederation of Labour."

WORKMEN'S COMPENSATION

"In Alberta, legislation is in force providing for compensation for injury to a workman by accident arising out of and in the course of employment, or by specific industrial diseases, except where the workman is disabled for less than a stated number of days."

"To ensure payment of such compensation, the provincial act provides for an accident fund, administered by the province, to which employers are required to contribute at a rate determined by the Workmen's Compensation Board in accordance with the hazards of the industry."

REGULATIONS OF HOURS AND ANNUAL HOLIDAYS

"In Alberta there is a maximum eight-hour day and 48-hour week for the workers to whom the statutes apply. Longer hours may be worked in an emergency or by permission of the administrative authority.

"Under Alberta's legislation, time and one-half is payable for all work in excess of 48 hours or of the regular work week if less.

"Workers are entitled to a week's holiday with pay after a year of employment. Two weeks with pay is given after two years' employment.

"Special provisions are in force for coal miners which provide one day's holiday with pay for every 23 days worked in a month (22 in February), but not more than two weeks' holiday in a year.

"Any further information that may be required concerning labour problems should be addressed to the Minister of Industries and Labour, Legislative Buildings, Edmonton, Alberta, or the National Employment Service, Edmonton, Alberta."

FAMILY ALLOWANCES

Family Allowances are paid in Canada by the Federal Government. They are paid in respect of children born in the Dominion of Canada, or in the case of immigrants, after one year's residence in Canada. The allowances are paid subject to certain conditions being complied with such as the child attending school regularly, being under 16 years of age, etc. Full details can be obtained from the Department of National Health and Welfare, Family Allowances Division, Edmonton, Alberta.

FAMILY ALLOWANCE RATES IN FORCE AS AT FEB. 1st, 1950

Under 6 Years	$5.00	per child per month
6th Birthday to 10th Birthday	$6.00	" " "
10th Birthday to 13th Birthday	$7.00	" " "
13th Birthday to 16th Birthday	$8.00	" " "

Income Tax where applicable is payable on Children's Allowance.

ACKNOWLEDGMENT

Acknowledgment and thanks are due to the National Employment Service, Edmonton office, whose kind assistance in the preparation of this section is much appreciated. Also to the Dominion Bureau of Statistics, whose Canada Year Book for 1948-49 has been freely quoted, and provided a great deal of the information contained in the foregoing section.

MARKET POSSIBILITIES FOR EDMONTON INDUSTRIES

In presenting the industrial potential of the City of Edmonton, some mention must be made of the market possibilities existing for industries developing around the city. Any attempt to present a detailed survey of those markets would be impossible within the scope of a publication of this nature. The greatest importance must be attached to market research, but this work, to be of any use, must not only be very thorough but constant and continuous as well.

The object of the following observation is to give some indication of where Western Canadian industry could expect to look for outlets in the future. The tendency to look only towards the larger centres of population in Eastern Canada, where competition from local industries might provide a sizeable obstacle, may cause other more lucrative outlets to be overlooked.

By this it is not suggested that Western industries should cut themselves off from Eastern markets, but as industry develops in the West it will be found that a large and ever-increasing range of products can be produced here, more cheaply than elsewhere. Those products are the ones that should find a natural market in the East of the Dominion.

The three prairie provinces—Alberta, Saskatchewan and Manitoba—together with British Columbia, the North West Territories and the Yukon were given a population of 3,563,000 in 1948. Since that time the population of Alberta has increased considerably, and it is probable that the next published figures will show considerable increases in the other provinces.

Edmonton, as a major transportation centre, is in a position to supply this area by rail, road and air.

The northern part of the province has been found to possess some of the finest agricultural land available anywhere; there is also the search for oil which is taking the exploration parties farther and farther north.

In the North West Territories there are signs of great mining activity which, with the advent of improved transportation facilities, will result in a still greater opening up of that vast territory.

To these areas Edmonton acts as a focal gathering and distributing point, and the development of this northland will assure the city still more trade and commerce.

In trying to gauge the possible industrial development of any centre, the long-term view must be taken into account. Simply because ready-made markets are not available at the present, one can not suggest that over the period of, say, the next fifty years they will not be.

Generally speaking, industrial centres grow slightly ahead of markets, meaning that as the centre grows it has to look for and create markets for its products. Very seldom has there been a situation where a large and ready market was waiting for a centre to establish itself.

Edmonton's industrial growth is just in its infancy. The oil, coal and natural gas, together with the prospects of a heavy chemical producing activity, hold out a bright future for the city in industrial development.

Edmonton stands today where the older industrial centres of the world stood, at the beginning of the nineteenth century, with this exception, that Edmonton is in a position to plan its future on sound lines based on the experiences of others. It can avoid the mistakes and costly failures of the past.

With this in mind, some attention can be paid to the possibility of developing an export trade, through the port facilities existing at the West Coast.

The markets available through this means are nearly all capable of enlargement. For instance, despite the general narrowing in other foreign markets, trade with the South Americas spotlighted itself by showing an over-all increase.

Any attempt to estimate the potential value of these markets would be impossible. However, trade sources in Ottawa have stated that ten years ago Canadian exports to the South Americas amounted to $20,000,000. Today they have topped $125,000,000.

For the purpose of this section, a rough analysis of the export possibilities has been carried out by contacting direct the trade departments of the leading South American countries. The results of this survey have proved that they are all anxious to do business with the West, if the West can provide them with what they want. Some of their requirements are given below and were supplied by them:

Agricultural Implements,
Articles for gifts and toys,
Book Stores and Stationery,
Cereals, Oats, Wheat, etc.,
Brushes, various,
Chemicals and compounds,
Construction material, including dressed and undressed lumber.
Dry goods.
Electrical equipment, heavy and light,
Electrical appliances.
Butter, Fish, Meat—packed.
Canned Fruit juices, Dried Fruits,
Preserved Fruits, Jellies,
Biscuits.
Vegetables, canned or dried.
Groceries, Wines, Liquors, Candies.
Hosiery and Novelty articles,
Hardware,
Industrial oil, greases, gasoline,
Jewelry and Silverware,

Leather and leather products,
Lumber,
Office equipment and furniture,
Patent medicines and Pharmaceutical products,
Plumbing requisites,
Sanitary goods,
Textile goods, woolens, cotton fabrics, etc.,
Toilet preparations.

In addition, several trade departments indicated an interest in iron and steel in various forms.

These countries are developing rapidly; already quite a lot of their requirements could be supplied by Edmonton industries. As the city develops industrially, more and more of the requirements will be capable of being met.

There would also appear to be good prospects for increasing Canadian trade with India and Pakistan once the present dollar shortage has been adjusted, and in this trade a Western industrial economy could benefit by exporting via the West Coast. Some interesting figures are available showing the volume of trade between Canada, India and Pakistan; they are as follows:

	Total Trade	Imports	Exports
1939 India and Pakistan	$14,974,000	$ 9,808,000	$ 5,166,000
1947 India and Pakistan	85,197,000	42,250,000	42,947,000
1948 India	67,098,000	33,400,000	33,698,000
1948 Pakistan	9,081,359	1,306,097	7,775,262
1948 India and Pakistan	$76,179,359	$34,706,097	$41,473,262

"It can be seen from the above that on the basis of a combined India and Pakistan, the total trade with Canada for 1948 as compared with 1947 shows a decrease of $9,000,000. This decrease, however, is mainly reflected in the import figures, while Canadian exports to those countries remains relatively the same as in 1947."

"If it is taken into account that some 25 per cent of all India is now Pakistan territory, the inference would be that Canadian trade with India alone has, on a territorial basis, as shown by the following table, shown a slight increase during 1948, and the fall-off in total figures would be due to the decrease of trade with Pakistan."

Canadian—Indian Trade Based on Territory

	Total Trade	Imports	Exports
1947 India and Pakistan	$85,197,000	$42,250,000	$42,947,000
Less 25%	21,299,000	10,562,000	10,737,000
1947 India	$63,898,000	$31,688,000	$32,210,000
1948 India	$67,098,000	$33,400,000	$33,698,000
Increase over 1947	$ 3,200,000	$ 1,712,000	$ 1,488,000

On the basis of present Indian territory, trade with Canada during 1948 showed an increase of approximately $3,000,000 over 1947.

Any recession in trade between Canada and India and Pakistan must, in a large measure, be blamed to the dollar short-

age. There is every reason to suppose that this is of a temporary nature only, and will eventually be resolved.

Out of a total of 367 different products and commodities which Canada has been exporting to India and Pakistan, some 72 of them could be produced quite easily in the Edmonton district by fully utilizing the materials and facilities which exist. Some of these items are listed below:

Selected Canadian Exports to India which could be produced in the Edmonton District.

	1947		1948	
	Quantity	Value	Quantity	Value
Jams, Jellies & Preserves	40,225	$ 8,375	60,840	$ 16,603
Wheat	.....	.....	694,400	$1,636,871
Oatmeal, rolled oats	32,228	$ 350,951	1,872	$ 22,802
Flour of Wheat	1,250,625	$16,792,444	61,646	$ 762,867
Belting of Leather	3,395	$ 6,209	8,979	$ 17,696
Milk Powder, whole milk cwt.	463	$ 18,305	159	$ 7,406
Milk condensed cwt.	.....	.....	719	$ 14,298
Milk evaporated cwt.	2,846	$ 31,006	12,941	$ 175,470
Milk preparations n.o.p. cwt.	5,213	$ 210,945	2,268	$ 106,739
Staves & headings of wood	.....	$ 66,198	.....	$ 51,127
Wood pulp, sulphate kraft, unbleached cwt.	.....	.....	11,994	$ 98,706
Manufactures of wood n.o.p.	.....	$ 32,151	.....	$ 52,224
Paperboard, n.o.p. cwt.	37,132	$ 283,272	1,600	$ 15,370
Book Paper cwt.	7,882	$ 127,593	1,037	$ 12,428
Newsprint Paper cwt.	290,830	$1,423,866	300,593	$1,865,392
Wrapping Paper, coated cwt.	134	$ 1,042	7,650	$ 62,261
Wrapping Paper, kraft, n.o.p. cwt.	1,976	$ 17,636	1,022	$ 13,066
Wrapping Paper, n.o.p. cwt.	1,698	$ 23,496	.....	$ .....
Bond & Writing Paper, cwt.	3,272	$ 45,451	1,265	$ 20,731
Paper & Manufactures, n.o.p.	.....	$ 129,270	.....	$ 21,493
Zinc Spelter, cwt.	8,960	$ 88,177	34,470	$ 483,275
Zinc Scrap, Dross and Ashes, cwt.	541	$ 4,231	6,057	$ 56,230
Radio Receiving Sets, No.	1,826	$ 102,423	1,486	$ 59,272
Electric Meters and Parts	.....	$ 175	.....	$ 28,272
Abrasives, artificial, manufactured	.....	$ 43,485	.....	$ 22,486
Acids, n.o.p. cwt.	5,480	$ 53,215	9,957	$ 118,496

Medicinal Preparations	.....	$ 199,746	.....	$ 109,212
Fertilizers	105,600	$ 246,340	60,000	$ 141,918
Fertilizers, manufactured, n.o.p. cwt.	235,203	$ 610,039	118,000	$ 324,500
Black, Carbon Lamp, lbs.	146,025	$ 20,554	556,800	$ 83,477
Paints, n.o.p.	.....	$ 220,520	.....	$ 19,579
Soda & Sodium Compounds, cwt.	.....	.....	15,630	$ 18,574
Synthetic Resin & Manufactures	.....	.....	.....	$ 21,870
Drugs & Chemicals, n.o.p.	.....	.....	.....	$ 174,201

In addition to the raw materials, products and manufactures referred to above, Indian importing houses have made inquiries for the following items, with a view to knowing whether they can be supplied by Canadian firms:

Agricultural Machinery
Analine Drugs
Bleaching Powder
Paper Products
Caustic Soda
Chemicals
Plywood Tea Chests
Fodder
Glass Bottles
Milk, Condensed
Milk, Powdered
Newsprint
Paper, White
Paperboard
Plywood
Soda Ash
Textile Chemicals
Heavy Chemicals
Zinc

The items listed are those that have been selected because of the possibility of producing them by means of the materials easily available to Edmonton. As industry expands in these parts, many more articles will be capable of being manufactured or processed here. The few mentioned are only a guide to what can come in the future.

Large finds of base metals have recently been reported from the North West Territories, immediately north of Edmonton. It is, therefore, reasonable to assume that at some date in the future this will be brought out for processing, and Edmonton with its facilities would be the obvious choice as a processing centre.

This very brief outline of the market possibilities for Western industries has been included because it forms a part of the potential of Edmonton's industrial future. There are, needless to say, many factors governing so intricate a matter as market potential. The possibilities are there, however, and when fully exploited there is every chance that they could be developed in a similar manner to that of other centres.

The potential represented by the Far East has not been mentioned here, due to the unsettled conditions prevailing at the present time. However, as conditions begin to settle down and the standard of living of the people commences to improve, the opportunities for Canada to trade with the Orient will become

more and more numerous. In this regard, Western Canadian industries have many advantages, among them that of distance. The long-range possibilities are immense, even though the immediate future may be fraught with difficulties. One thing is certain, and it is that the next decade will see the Far Eastern peoples forging ahead. This will create a steady and growing demand for the manufactures of the Western world. Now is the time for Canada, particularly Western Canada, to lay the foundations for future trade.

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Thanks are also due to the trade departments of the South American countries who were kind enough to supply information as to their current imports.

CANADIAN METALS AND MINERALS

The natural resources particularly available to Edmonton have been dealt with in detail elsewhere. However, to complete the picture and indicate where certain important raw matrials can be obtained, the following sections review the Canadian metal and mineral industry, from the point of view of its commercial activity.

Acknowledgment and thanks are due to the Bureau of Mines, Canada, Department of Mines and Resources, who have gone to a great deal of trouble to verify and bring up to date the original manuscript submitted to them. Their help has been greatly appreciated.

ALUMINUM

The Canadian aluminium industry is second only to that of the United States. This is particularly interesting as no bauxite or ore of aluminium is to be found in Canada. The development of the industry is largely due to the abundant low-priced hydro-electric power available.

One company only is responsible for production of aluminium in Canada, and their plants are situated in the Province of Quebec. They have a total rated capacity of 550,000 tons of aluminium a year, equivalent to over 20 per cent of the world's estimated production capacity. The primary production takes the shape of aluminium ingots.

The lack of bauxite in Canada is to some extent offset by the occurrence of other potentially important ores containing from 20 to 30 per cent of alumina. Such ores as, for instance, clay, shale, nepheline syenite and anorthosite are to be found in many parts of the country, and some are referred to elsewhere in this publication under their separate headings.

Production of aluminium (ingots, etc.) in Canada in 1948 amounted to 367,079 tons. Export figures for 1948 show that $102,046,428 worth of aluminium (including scrap) and aluminium products were exported, of which ingots, bars, blocks and blooms comprised $84,191,712.00.

Imports of aluminium products (semi-manufactured and fully manufactured) for the same year were valued at $6,635,-897.00 and, in addition, 6,691 tons of cryolite valued at $1,031,813 and 2,008,494 tons of bauxite valued at $9,884,001.00 were brought into Canada for making aluminium.

ANTIMONY

Largely due to a decline in production in Bolivia, antimony continued in short supply up to and including 1946. As a result

of the general world shortage, it was subject to government control as to price and use. China has long been the world's main source of antimony however, output there has been at a greatly reduced level since the war.

Metallic antimony ceased to be produced in Canada in 1944, where the electrolytic type had been produced at Trail, British Columbia. However, an antimonial lead containing 25 per cent of antimony continues to be produced there from antimonial fume residues that are a by-product of the lead-zinc smelting operations carried on at Trail.

In British Columbia there are several occurrences of antimony, one or two having been developed to some degree. After test shipments of the metal from the Bridge River area in 1941, it was considered that this source warranted some attention.

In 1941 the production of antimony in Canada amounted to 3,185,077 pounds—valued at $445,911, while imports for the same year amounted to 2,240 pounds, valued at $423. The 1948 figures show that production of antimony (content of antimony in antimonial lead) amounted to 310,062 pounds, valued at $113,173, and imports of metallic antimony to 1,094,000 pounds, valued at $351,942.

If industry in Edmonton required antimony in a sufficiently large way it might be possible to obtain shipments from B.C., otherwise supplies would have to come from normal sources in Eastern Canada.

As a matter of interest, there are some deposits of antimony south of the Alberta border in Montana, one or two of these being reported as extensive.

Antimony acts as a valuable raw material to the chemical, as well as the pulp and paper industry, both of which will be considerably developed in Alberta in the future; its presence close at hand is a valuable asset to Alberta's industrial future.

ARSENIC

In Canada arsenic is principally used in the glass-making industry, which in 1948 required for production some 432,449 pounds. As valuable deposits of glass sands have recently been discovered close to the town of Peace River, there is some reason to assume that the future will see an enlarged development of the glass industry in Alberta. Supplies of arsenic would in this event be important.

Ontario and Quebec are the major producers of arsenic in Canada, but a gold arsenic concentrate is produced in British Columbia and is shipped to the smelter at Tacoma, Washington. As no payment is made for the recoverable arsenic, the production is not included in the statistics published on arsenic. Some

arsenic is also produced in Montana, U.S.A., south of the Alberta-Montana border.

The production of arsenic in Canada reached a high of 3,927 tons valued at $580,893.00 in 1942, but was only 581 tons in 1948 valued at $82,909.00.

BISMUTH

The known deposits of bismuth ore in Canada are few. It is considered possible, however, that the metal occurs with other molybdenite deposits, such as was found to be the case in the La Corne mine in Quebec. Here the molybdenite was found to contain an appreciable percentage of bismuth, and a method was discovered of separating the bismith from the molybdenum concentrate, and a small tonnage of bismuth concentrates and, later, metallic bismuth was produced, but operations ceased in 1947.

Probably the most important known occurrence of bismuth in Canada is in the Sullivan mine near Kimberley, British Columbia, where the bismuth in very small amounts is associated with the lead-zinc-silver ore.

An occurrence of tetradynite (telluride of bismuth) was found some years ago near Smithers, British Columbia.

The nearest source of bismuth production to Edmonton would be Trail, British Columbia, the sole source of output in 1948. Here bismuth is produced from the residues resulting from the electrolytic refinery of lead bullion.

In 1948 production of bismuth in Canada amounted to 240,242 pounds, valued at $480,484.00.

CADMIUM

The production of cadmium in Canada is limited to the by-product recovery from manufacture of electrolytic zinc. Due to the many important uses in industry, the demand for cadmium is likely to increase in the future, and further efforts may be made to produce it on a still larger scale. During 1948 the domestic production increased by 6 per cent over 1947. It is, of course, a constituent of nearly all zinc ores and is also found in some lead ores. Large discoveries of both zinc and lead have recently been made in the North West Territories, north of Edmonton. Road and rail communication are being discussed for these northern areas, linking them with Edmonton. It is, therefore, not improbable that Edmonton may become a centre for the commercial and industrial distribution of cadmium among a host of other like products.

At the present time cadmium metal is produced at Trail, British Columbia, where it originates from the silver-lead-zinc ores processed there. This is the nearest production point to Edmonton, and in 1948 was responsible for 80 per cent of the

Canadian output. The annual rated output capacity of the plant there is 700 tons of cadmium metal of a purity of 99.99 per cent. The copper-gold-zinc ores of the Flin Flon deposit on the Manitoba-Saskatchewan border are another source of production of this product.

The 1948 production of cadmium in Canada amounted to 766,090 pounds, valued at $1,398,114. (Compared with 1,251,291 pounds, valued at $1,469,016, in 1941, the peak year), of which 80 per cent came from British Columbia.

The export of this product in 1948 amounted to 596,098 pounds, valued at $1,395,349, almost all of which was shipped to the United Kingdom.

CHROMITE

The greater part of Canadian output of chromite comes from Eastern Quebec. There are large deposits of chromite in south-eastern Manitoba. These deposits contain too much iron for commercial purposes, but research work on beneficiation is under way, and if successful these deposits would be more readily available for western industrial requirements than those at present in production in Quebec.

In addition to its large use by the metallurgical industry, chromite is used extensively in the chemical industry, mainly in fundamental salts such as sodium and potassium bichromites. It is also used in the production of refractory materials. As there is a very probable future for the alkali chemical industry in the vicinity of Edmonton, chromite deposits nearer at hand than Eastern Canada would be useful.

In 1948 imports of chrome ore amounted to 69,183 tons, which were used for metallurgical (by far the most important) refractory and chemical purposes.

The metallurgical industry used 64,000 tons in 1948. At the end of the year stocks on hand amounted to 32,711 tons.

The import figures for chrome ore in 1948 showed that 31,133 tons reached Canada via the United States and that 27,140 tons came from the Union of South Africa, and the small remainder from Southern Rhodesia, Philippines, Turkey and Cuba. The total value of the imports was $1,957,692.00.

It can be seen from the above that the possession of large reserves of commercially useable chromite would prove to be of the highest importance to Canadian economy.

Extensive deposits of chromite occur in Montana, south of Alberta, in the United States. These deposits have been estimated to contain 10,000,000 tons of possible ore and about 20,000,000 tons of speculative ore ranging from about 20 to 29 per cent chromic oxide. During the war years Montana produced 142,180 short tons of chromite, valued at $3,713,000.00.

COBALT

Cobalt production in Canada is confined to the Cobalt district of Ontario. In 1948 the cobalt content of Canadian ores, concentrates, oxides, metal and salts of the metal shipped amounted to 772 tons, valued at $2,029,178, compared with only 286 tons in 1947.

The shipments included 3,000 tons of concentrates, containing 323 tons of cobalt, from stockpile at Deloro, Ontario, which was produced in the Cobalt area of Ontario, during the war and purchased at the time by the United States government.

From the summer of 1940 until May, 1946, the refinery at Deloro, the sole plant in Canada at present treating ores for the production of both cobalt metal and compounds of cobalt, worked entirely on imported cobalt residues derived as a by-product in the treatment of copper ore mined in Northern Rhodesia. Since 1946 the residues have been shipped to Belgium. The nearest production of cobalt to Edmonton would be that in Ontario.

COPPER

The principal current sources of copper in Canada are the Provinces of Ontario, Quebec, Saskatchewan, British Columbia and Manitoba—in that order. As yet, there are no worked deposits of copper in Alberta, though copper is known to exist in the Rocky Mountains area.

It is possible that specimens of bornite, chalcocite and cuprite, obtained from near the east end of Great Slave Lake, will have some commercial significance once communications to these areas are improved. At the moment a great deal is being done to improve and develop communications between Edmonton and the north, and a marked improvement is noticeable over the past few years.

The large discoveries of base metal, including copper, which have recently been disclosed as being present in the North West Territories, to the north of Edmonton, places the city in a very fair position of becoming the distributing centre for this wealth.

At present industry in the city requiring copper would have to obtain it from one of the sources mentioned above, the nearest being in the adjoining Province of Saskatchewan.

Total copper production in Canada amounted to 240,732 tons in 1948, valued at $107,159,756.

Copper occupies a prominent place in Canada's export trade, with a value of $78,979,346 credited to it in 1948 from 116,169 tons of copper in ingots, valued at $50,682,650; 28,639 tons of copper in rods, strips, sheets, tubing and plates, valued at $14,008,209; 28,556 tons of copper in ore and matte, valued at $9,137,840; copper wire and screen, valued at $3,268,949; and copper scrap, slag, skimmings and sludge, valued at $1,881,698.

GOLD

In 1948 Canada ranked third among the world's producers of this metal, which amounted to 29,600,000 ounces, according to U.S. Bureau of Mines, which placed Russia's production at 7,000,000 ounces. Of the world total, Canada produced nearly 12 per cent, while the Union of South Africa accounted for 39 per cent.

While gold is produced in Ontario, Quebec, British Columbia, Saskatchewan, Manitoba, Yukon, North West Territories, Nova Scotia and Alberta, it is the Alberta and possibly North West Territories production of the metal which is of interest to Edmonton.

Gold occurs among the gravels of the rivers which drain down the eastern slopes of the Rocky Mountains. Information would tend to show that the North Saskatchewan, Peace and Laird Rivers contain placer gold in important quantities. As far back as 1887 gold was known to exist in certain rivers of Alberta, and among the more prominent discoveries were those west of Fort Saskatchewan, about 20 miles east of Edmonton. In 1948 Alberta production of placer gold amounted to 78 ounces, valued at $2,730.00.

In the North West Territories, to the north of the Province of Alberta, gold to the amount of 101,625 ounces, valued at $3,556,875, was produced in 1948. With the advent of hydro-electric power from the Snare River project, the output of this area may be considerably increased. The construction by the government of Alberta of an all-weather road from Grimshaw, near railhead at Peace River, to Great Slave Lake, a distance of 378 miles, will so improve transportation difficulties between this rich territory and Edmonton that the whole picture of Edmonton's industrial future may well undergo a great and lasting change—in the not too distant future.

IRON ORE

For a long time there has been much speculation over whether or not iron ore exists in Alberta. Its existence in any large quantity would be of the most paramount importance to the economy of the West. With the abundance of cheap fuel and the availability of other raw materials, the possession of iron ore in commercial quantities would not only have a marked effect on the future wealth and prosperity of the West, but, like the recent discoveries of oil, could well add tremendously to the material wealth of Canada.

There is no doubt that iron does exist in Alberta; it has been seen in different forms in a variety of places. However, though a considerable number of investigations have been made, from time to time, it has not been possible for the experts to

report any iron ore beds worthy of commercial development at the present time.

LEAD

One of the world's greatest producers of lead and zinc is British Columbia. From this source in 1948 came more than 95 per cent of Canada's lead production.

At Trail, British Columbia, 160,107 tons of refined lead were produced in 1948. The value of the 1948 production of lead was the greatest yet recorded in any one year to date, $60,344,-146. This was probably due to a strong demand and marked increase in price for the metal from abroad.

Canada consumed nearly 36 per cent of the refined lead production compared with 13 per cent, the average during the five-year period, 1935 to 1939.

It should be noted that the world consumption of lead was considerably increased over the pre-war period, and the demand does not look like being met for some time.

Edmonton's position in relation to this metal is good. Any that might be required for industrial purposes can be obtained from the adjacent Province of British Columbia by direct rail route. In addition, exploration of a 500 square mile concession on the shores of Great Slave Lake has indicated some 500,000 tons of ore averaging 7 per cent lead and 9 per cent zinc. A deposit of lead-zinc-silver ore was discovered near Indian Mountain Lake, at the end of Great Slave Lake. Drilling has indicated ore from these areas as containing 3 per cent lead, 20 per cent zinc and 8 ounces of silver per ton. The property is being developed at present. The construction of the all-weather road from end of steel at Grimshaw, Alberta, to Great Slave Lake, will eventually assure Edmonton considerable business in the possible processing, and certain distribution of production from this area.

In 1948 Canada produced 167,257 tons of lead, of which 160,025 tons were in refined form. Exports of refined lead in that year amounted to 103,762 tons, having a value of $32,758,-574, of which 50 per cent went to the United States and 45 per cent to the United Kingdom. The lead exported in ore and concentrate form reached 5,607 tons, valued at $1,563,492, compared with 6,726 tons in 1947.

The importation of lead and lead products amounted to $5,454,429 in 1948, of which by far the greater part was due to imports of tetraethyl lead compound from the U.S.A., which accounted for $5,131,472.00.

MAGNESIUM

The field of usefulness for this metal is steadily expanding, and, therefore, the demand can be expected to increase in the future.

Production of magnesium in Canada during 1948 was confined to the Aluminum Company of Canada Limited, which operated its electrolytic magnesium plant in Quebec during part of the year. The raw material used was magnesia obtained from brucite limestone at its plant, also in Quebec.

MANGANESE

There has been no production of manganese ore in Canada since 1943, apart from a small output off bog manganese in New Brunswick in 1947 and three tons of ore from the Magdalen Islands, Quebec, in 1948. Known deposits of high-grade manganese ore in Canada are now exhausted, and supplies have to be relied upon from foreign sources.

As there is a very real possibility that chemical, glass and paint industries which require manganese in their production process, will be locating in the vicinity of Edmonton in due course, it is interesting to note that manganese may be obtained from the State of Montana, U.S.A., which adjoins Alberta to the south. Manganese ore has been produced from mines in the Butte district of Montana, and figures available indicate that since 1916 some 2,035,574 tons of manganese ore, valued at $56,033,937, has been produced from this source. This manganese ore concentrated and sintered has yielded a high quality of "nodule".

As a very large proportion of Canadian importation of manganese comes in from the U.S.A., it is conceivable that western industries could obtain their requirements from the Montana source more economically than from Eastern Canada.

MERCURY

Canadian production of mercury ceased in 1944. Since then shipments have been made from producers' stock. The main source of supply when it was being produced was British Columbia, where the largest single producer in the Western Hemisphere was located. Unlike most metals, mercury is in abundant supply and production of it is unlikely to be necessary for some time.

Canadian imports of mercury in 1948 amounted to 803,852 pounds, nearly twice as much as in 1947, apparently as a result of the installation of two more plants using mercury cells for the production of caustic soda and chlorine.

MOLYBDENUM

Molybdenite (the ore of molybdenum) occurs widely in Canada, but production ceased in December, 1947. The 163 tons of concentrate, averaging 94.4 per cent molybdenum sulphide, that remained in stock at the end of 1947 was shipped to Europe in 1948. They were valued at $137,143.00.

At one time, due to the high bismuth content of the molybdenite produced in Quebec, the ore was not acceptable. However, in 1946 the Bureau of Mines in Ottawa developed a process which not only freed the concentrates of this metal from bismuth but raised the molybedenum content. This process has so raised the content of this concentrate that it is now probably higher than that of any other concentrate in the world. The bismuth extracted is saved as a by-product. Nearly seven tons of this bismuth, the remainder of the stock at the end of 1947, was also exported to Europe.

There are somewhere in the region of 400 molybdenite deposits and occurrences in Canada.

All molybdenum addition agents used in Canada are imported from the United States. Imports in 1948 amounted to 167 tons of contained molybdenum, of which about 39 per cent was in the form of ferromolybdenum, 57 per cent as molybdenum trioxide, and the remainder as calcium molybdate and sodium molybdate. Consumption of these products by Canadian steel furnaces in 1947 amounted to 139 tons of contained molybdenum. About 70 per cent of the molybdenum consumed is used as an alloying agent in steel manufacture.

Any molybdenum required by industry in the vicinity of Edmonton would have to be obtained from sources in the east of Canada.

Reports claim that there is a substantial deposit of molybdenum—3,000,000 tons—in the Neihart area of Montana, U.S.A., south of the Alberta-Montana border. It is not known whether the deposit is being worked.

NICKEL

At the moment there are no known commercial quantities of nickel in Alberta. Canada's source of nickel is the Sudbury district of Ontario. Since the war, production was greatly cut down until the middle of 1946 when the demand increased rapidly, and that year exports were only 20 per cent below the annual average during the war years of 1943 and 1944, and exceeded the figures of 1945.

Northern Manitoba shows promise of becoming an important producer of nickel, with copper as a by-product. The Lynn Lake deposits are being developed by Sherritt Gordon Mines Limited and have produced, up to the end of 1948, ore to the amount of 8,300,000 tons, averaging 1.514 per cent nickel and 0.687 per cent copper.

One hundred miles east of Vancouver, near Choote in British Columbia, development work was carried out on a nickel deposit during 1933 to 1936 inclusive, and some 2,000 tons in all, mainly of picked ore averaging 4 per cent nickel, was shipped in 1936 and 1937 to Japanese smelting interests for experimental

purposes. There has been no production since those shipments. At January 1st, 1937, the indicated ore was estimated at 1,183,500 tons, averaging 1.39 per cent nickel and 0.5 per cent copper.

All signs would indicate that nickel production in "peace time" is likely to far exceed that of "war time" before very long.

The output in 1948 was 263,479,163 pounds (valued at $86,904,235), compared with 288,018,615 pounds in 1943, the greatest yet recorded for any year. Canada is the world's outstanding source of this metal.

PLATINUM AND PLATINUM GROUP METALS

Canada is probably still the principal world producer of these metals, furnishing in 1948 a total of 269,747 ounces, valued at $16,917,982.00, all of which was derived from the nickel-copper ore of the Sudbury district of Ontario, except 242 ounces credited to gold placers in the Yukon and British Columbia.

Metals of the platinum group, together with gold and silver, are contained in the anode residues obtained by the International Nickel Company in the refineries at Port Colborne and Copper Cliffe in Ontario. These residues are shipped for treatment to Acton, England.

Platinum metals contained in matte made at the smelter of Falconbridge Nickel Mines Limited, at Falconbridge in the Sudbury district, are recovered in that company's refinery at Kristiansand, Norway.

Plantiniferous deposits of nickel-copper near Hope, in British Columbia, and at Shebandowan Lake, 75 miles west of Port Arthur, Ontario, remain undeveloped.

In the fall of 1948, Nicholson Mines Limited shipped six lots of hand-cobbed ore from its property near the north shore of Lake Athabasca in Saskatchewan. The content of platinum and palladium ranged from 0.01 ounces per ton to as high as 15.56 ounces per ton.

Exports of platinum metal in 1948 were valued at $16,776,733.00.

SELENIUM

Selenium, used to a large degree in the making of glass and rubber, is widely distributed throughout the world, but nowhere in sufficient concentration to permit of its profitable recovery singly. In Canada, it is produced in Ontario, Saskatchewan, Quebec and Manitoba, from the anode slimes deposited during the electrolytic purification of copper.

Production of selenium in 1948 amounted to 390,894 pounds, valued at $781,788.00, compared with the peak of 521,867

pounds, valued at $949,798.00 in 1946. Canada and the U.S.A. are the world's principal producers.

SILVER

British Columbia accounted for over 41 per cent of 16,109,-982 ounces of silver produced in Canada in 1948. Base metal ores contributed over 14,000,000 ounces to the total.

Canadian production of silver reached an all-time high of 32,869,264 ounces in 1910. Since that time demand for silver has increased while production has declined. This was shown up in a reduction of export bullion. In 1938 Canada exported 22,-682,681 ounces, plus a further 5,868,827 ounces contained in concentrates and ores.

Excluding Russia, Yugoslavia and some other countries for which no data are available, the leading contributors to the world's output of silver in 1948 were in order: Mexico, United States, Canada and Peru.

TELLURIUM

This metal has no great application in industry, though during recent years an important use has been found for it in the rubber industry, where it does much the same as selenium by contributing to the heat-resisting qualities. In the metallurgical field it is used in small quantities to improve the physical properties of certain lead, copper and magnesium alloys, and as a corrosion resistant to stainless steel, cast iron and tin.

The bulk of Canada's production comes from the east of the Dominion, and in 1948 amounted to 11,425 pounds compared with the peak of 48,237 pounds in 1938. Canada and the United States are the world's principal producers.

TIN

To date no commercial quantities of cassisterite, the ore of tin, have been found in Canada. Minor occurrences, principally cassisterite ($Sn\ O_2$), the most important tin mineral, are found in a number of places throughout Canada. So far no deposits of economic importance have been discovered.

The source of the Canadian output—691,332 pounds, valued at $688,567 in 1948—is the small percentage of cassisterite in the lead-zinc-silver ore of a mine at Kimberley, British Columbia. The tin in the cassisterite is recovered as a by-product from the concentration of the ore from this source.

Canadian consumption of primary tin in 1948 amounted to 4,046 long tons, of which 2,181 long tons were used in the tin-

plate and tinning industry—1,241 for solder, 220 for Babbitt metal, 281 in brasses and bronzes, 45 for tin foil and collapsible tubes.

TITANIUM

Large deposits of titanium bearing ores exist in Canada, but there are as yet no plants for manufacturing titanium products. All production of the ore in 1948—4,441 tons—went for export.

The Canadian ores fall into two classes:

1. Ilmenite, containg 30 to 40 per cent TiO_2, and
2. Titaniferous magnetite, which is composed of ilmenite and magnetite, mixed intimately in varying proportions, with a content of 5 per cent or more TiO_2.

The second class of ore is the more common in Canada, but does not appear to be used as a source of titanium at the moment.

This ore occurs in Alberta in the form of deposits of magnetic beach sands containing titanium. At Burmis, in the Crowsnest Pass, a bed of this sand has been consolidated into solid ore.

In 1948 plans were made for the establishment of a substantial titanium industry, based upon development of a large deposit of ilmenite at Allard Lake, Quebec. A railway 27 miles in length is under construction from Havre St. Pierre on the Gulf of St. Lawrence to the ore body. A smelting plant for the treatment of the ore is to be built at Sorel on the St. Lawrence, 40 miles below Montreal.

Experiments are being carried out to discover if it is possible to produce titanium metal on a commercial scale. The metal melts at about 1800° C, can be rolled, drawn and forged, and has a specific gravity of 4.5 (iron 7.8), it has excellent corrosion resistance, except for certain acids, and shows no tarnish after 30 days' exposure to salt spray.

The tensile strength of the annealed metal is 82,000 pounds per square inch; cold worked to 50 per cent reduction, the tensile strength is 126,000 pounds per square inch. These properties suggest important uses for the metal when the cost of producing it has been sufficiently reduced.

TUNGSTEN

The ores from which tungsten is commercially obtained are two tungstates, named wolframite and scheelite. Scheelite, which is of relatively much commoner occurrence than wolframite, has been the source of most of Canada's small output of tungsten. Occurrences of scheelite have been found in nearly every province of Canada.

British Columbia was the source of the tungsten concentrates—1,046,160 pounds—produced in Canada in 1948. There is no present production.

ZINC

To Canada's output of zinc in 1948, which surpassed in value that of any other year, British Columbia contributed 58 per cent, Manitoba and Saskatchewan 22 per cent, and Quebec 20 per cent.

Discovery of lead-zinc deposits in the North West Territories, north of Edmonton, provide interesting possibilities for the future of industrial development in the vicinity of the city. Occupying the strategic position that it does, as the terminus of the Northern Alberta Railway, and the highways leading up into the north, Edmonton will naturally play a big part in the development of raw materials in that area.

A 500 square mile concession surrounding a lead-zinc deposit on the south shore of Great Slave Lake was granted to interests who have commercial development in mind.

Extensive drilling exploration was commenced in an attempt to disclose new ore bodies. Drilling carried out in 1930 indicated 500,000 tons, averaging 9 per cent zinc and 7 per cent lead.

Preliminary drilling of a zinc-lead-silver deposit, discovered by prospectors at the east end of Great Slave Lake, indicated a zone 250 feet long and 18 feet wide, averaging 20 per cent zinc, 3 per cent lead and 8 ounces of silver per ton.

Several other zinc-lead discoveries have been reported from the Great Slave Lake area.

Prior to 1939 Canada's consumption of refined zinc amounted to some 20,000 tons per year. During the war it rose to 80,000 tons in 1943, but declined to 46,900 tons in 1948.

In 1948 Canada produced 234,164 tons of zinc (refined metal and metal concentrates exported), valued at $65,237,956.00, compared with 207,863 tons in 1947, valued at $46,686,010.00.

The production of refined metal in 1948 amounted to 196,575 tons, of which 144,887 tons were exported, mainly to the United States and the United Kingdom correspondingly. Figures in 1947 were 178,264 and 137,228 tons respectively.

Exports of zinc concentrate—all to the U.S.A.—amounted to 54,227 tons in 1948, or about 23 per cent of Canada's output in that year.

GARNET

In Canada, no garnet was mined or milled in 1948. From 1943 to 1947 garnet ore was mined near River Valley, Ontario, and shipped to Sturgeon Falls, where it was crushed and concentrated to about 95% garnet grain, and finally, pulverized into flour grades for use in the optical trade. Production at River Valley was resumed in May, 1949.

Over 85% of world output of garnet comes from North Creek, New York, and this product is recognized to be the world's standard garnet. U.S. production in 1948 was estimated at about 6,000 tons, compared with 8,722 tons in 1947.

For the manufacture of sandpaper Canada consumed 500 tons of garnet per year. Competition from artificial abrasives has proved a serious factor in the development of garnet production.

GRINDSTONES, PULPSTONES and SCYTHESTONES

Materials suitable for these products occur in various parts of Canada, notably in Nova Scotia, New Brunswick and British Columbia. Once again the demand for natural stones has decreased. 1948 shipments of grindstones produced in New Brunswick amounted to only 220 tons compared with 335 tons in 1947. There were no exports.

There is ever growing competition from Canadian made artificial stones, mostly of the silicon carbide grit, and these are used in various Canadian pulp mills.

VOLCANIC DUST
(Pumicite or Pumice Dust)

Deposits of volcanic dust occur in Alberta, Saskatchewan and British Columbia. There has been no production in recent years.

An analysis of volcanic dust taken from a deposit in Nanton district of Alberta produced the following report:—

Silica	61.34	per cent
Alumina	21.40	" "
Iron Oxide	4.21	" "
Lime Oxide	1.54	" "
Magnesium Oxide	.46	" "
Ignition Loss	8.50	" "
Sodium and Potassium Oxide	2.55	" "
Sulphides	Trace	
	100.00	

ALUMINUM SULPHATE

Deposits of this material are known to exist in Alberta, and samples have been taken which produced the following analysis:

Analysis of Aluminium Sulphate from Smoky River Deposits

	Per cent	Per cent
Insoluble in water	4.75	3.02
Analysis of water soluble:		
Sulphuric Anhydride (SO_3)	67.18	73.56
Alumina (Al_2O_3)	16.21	10.04
Iron Oxide (Fe_2O_3)	6.19	4.16
Lime (CaO)	-------	-------
Magnesia (MgO)	8.24	9.74
Potash (K_2O)	2.06	2.32

ASBESTOS

The principal producing area for asbestos in Canada is the eastern townships of the Province of Quebec. The asbestos from that province is practically all of the Chrysotile variety. Canadian deposits are the largest known anywhere.

British Columbia and Ontario both have deposits of chrysotile asbestos. The fibre from some of these deposits has a very low iron content and is free from magnetite, therefore making it especially suitable as insulation material for electrical machinery. At the end of 1948 a very large deposit of chrysotile asbestos was found near Matheson, Ontario. Production from it is expected to commence late in March, 1950.

Despite Canada being the world's principal producer of asbestos, she still imports a sizeable amount of finished asbestos goods as the 1948 figures show. In that year imports of packing, brake linings and clutch facings for motor vehicles, and other asbestos manufactures had a value of $3,751,979.

The United States provides the world's largest market for asbestos, and Canada's proximity to that market is a great advantage to her asbestos industry.

BARITE

Domestic requirements of this mineral being small the bulk of the production of both crude and ground barite was exported in 1948. To the output of 95,747 tons (crude and ground) Nova Scotia contributed 94,068 tons, British Columbia 1,632 tons, and Ontario 47 tons.

British Columbia producers shipped 1,167 tons of crude barite to customers in Montreal in 1948 and 305 tons to a plant at Crowsnest, Alberta, where it was ground for use in glass making and in oil well drilling needs. With the increase in oil-well drilling the quantity of barite shipped to Alberta will doubtless increase. In 1948 about 92 per cent of the exports of crude went to the United States, the remainder to Europe. Almost all the

exports of ground barite went to the West Indies, South America and Arabia.

Exports in 1948 totalled 95,787 tons valued at $1,219,017. They comprised 38,596 tons of crude barite and 57,191 tons of ground barite.

The Montreal receivers of the British Columbia shipments grind the crude, disposing of their output in both domestic and foreign markets.

This opens up an interesting topic as it shows that it is possible to ship long distances in Canada and still compete on a commercial basis.

BENTONITE

Alberta, Saskatchewan, Manitoba and British Columbia contain most of Canada's deposits of bentonite, but Manitoba and Alberta were the sole sources of supply in 1948.

Manitoba's production came from the southern part of the Province. The bentonite is of the non-swelling type; possesses bleaching properties in the crude state; these are enhanced by activation treatment with sulphuric acid.

In Alberta, production came from the Red Deer valley in the Drumheller area. However, considerable deposits are known to exist at Onoway about 35 miles from Edmonton on the Northern Alberta Railway. Alberta bentonite is of the highly colloidal, swelling type, suitable for controlling the viscosity of oil drilling muds and for foundry use.

In 1948 the Canadian production of bentonite (crude) totalled 16,440 tons, of which 14,140 tons came from Manitoba and 2,300 tons from Alberta.

The value of the ground natural clay and the activated material produced in 1948 was $415,408, compared with $306,882 in 1947.

In 1948 the value of imports of activated clay was $272,586, compared with $242,483 in 1947. All were from the U.S.A. which is the world's chief producer and user of bentonite. U.S. production of this product in 1947 rose to the all time record of 763,889 tons, valued at $5,959,586. This would offer grounds for assuming that the production of bentonite in Canada could be increased, and its availability in close proximity to Edmonton would prove useful in any expansion of the present foundry industries.

The following is an analysis representative of the pure bentonite found in the Edmonton formation and was made by the University of Alberta:

ANALYSIS OF PURE BENTONITE FROM EDMONTON FORMATION

Silica	69.46	per cent
Iron Oxide	3.35	" "
Alumina	16.25	" "
Lime	2.06	" "
Magnesia	2.76	" "
Ignition Loss	5.04	" "
Alkalis, etc.	1.08	" "
	100.00	

CEMENT

Raw materials for the manufacture of cement, namely limestone and clay are widely distributed throughout Canada. These materials exist in Alberta. In addition to the ordinary variety of Portland cement, several other varieties including high-early-strength, alkali-resistant, and white cement are made. Imported clinker is used for making the white variety. Remarkable uniformity in the quality and physical properties of the standard variety of cement is obtained due to the fact that all plants in Canada operate on the wet process of cement manufacture.

At the present time four companies constitute the whole of the Canadian cement industry. They have manufacturing plants located in Quebec, Ontario, Manitoba, Alberta and British Columbia. There are also grinding plants in New Brunswick and Nova Scotia. To meet the rising demand for cement, Canada Cement Company, Limited, brought an additional kiln of 700,000 barrels annual capacity into service at its Exshaw plant, Alberta, in May, 1948, and have since installed a new kiln with a capacity of 1,200,000 barrels a year at its Belleville plant, Ontario. St. Mary's Cement Company, Limited, also installed an additional kiln with a capacity of 900,000 barrels a year in its plant at St. Mary's, Ontario.

Cement production in 1948 was 14,127,123 (350 lbs.) barrels valued at $28,264,987, compared with 11,936,245 barrels valued at $21,968,909 in 1947. The output in 1948 was at a new annual peak in both quantity and value.

Exports totalled 72,999 barrels of which Newfoundland received 29,687 barrels and Venezuela 23,625 barrels.

Imports of this product in 1948, mostly from the U.S.A. and Belgium, amounted to 1,120,671 barrels valued at $3,995,173, compared with 1,248,625 barrels valued at $3,843,652 in 1947.

Over and above the figures quoted for 1948, 118,933 barrels of white Portland cement clinker valued at $92,195 was imported from the U.S.A. for processing in Canada.

CLAYS AND CLAY PRODUCTS

The Clay Products industry depends in the main on the availability of cheap fuel, and good transportation to convey the finished products to market. These two factors are readily available in Edmonton, together with adequate space for setting up plant.

At the moment the industry around Edmonton is generally confined to the making of common brick; as far as can be gathered the demand for these bricks is far exceeding the available supply. With the increased building and industrial expansion expected in the City in the future, there would appear to be ample room for a modern plant able to produce bricks on a year round basis.

Various samples of raw materials occurring at points west of Edmonton have been tested and found suitable for the production of such wares as: common, pressed and paving bricks, drain tile, structural tile and possibly sewer pipe.

In Canada generally the industrial clays are classified as common clays, stoneware clays, fireclays, china clays, and ball clays, the domestic clays being used for the making of building brick, roofing tile, sewer pipe, pottery, structural tile, drain tile, stoneware and refractories.

For the purpose of manufacturing electrical porcelain, sanitary ware, sewer pipe, tableware, pottery, ceramic floor and wall tile and various kinds of fireclay refractories, certain clays are imported into Canada from, principally, the United States and United Kingdom.

Common Clays.

These are well distributed throughout Canada, and as stated, exist in Alberta, and are available to Edmonton.

Stoneware Clays.

Saskatchewan is the largest producer of this product and owing to the availability of cheap natural gas, quantities are being shipped into Southern Alberta for manufacture into stoneware, tableware, etc. Supplies of this clay could be made available in Edmonton if required. Stoneware clay, or low grade fireclay, has been observed in outcrops in the Cypress Hills district of Alberta. It is said to have a fusion point of about 1680°C. No development of this deposit on a commercial scale appears to have been undertaken as yet.

Fireclays.

Firebrick and other refractory materials are manufactured at a plant some 50 miles from Vancouver in British Columbia from a high grade, moderately plastic, fireclay that is extracted

by underground mining from the clay beds in the Sumas Mountains.

China Clay, Ball Clay, etc.

China Clay or Kaolin has been produced on a commercial basis in Canada only at one point in Quebec, but the project was abandoned during 1948 because of mining and operational difficulties. As already stated the china clay and ball clay used in porcelain, sanitary dinnerware, etc., are imported from the United Kingdom and United States.

Production and Trade.

In 1948 the products manufactured from Canadian clays, including the sales of domestic clays, were valued at $17,629,048. Imports of clays in 1948 were valued at $2,362,843, and of clay products at $28,326,103. Value of clay products made from the imported clays was $12,350,000. Exports of clay products had a value of $1,489,476 in 1948, compared with $1,165,846 in 1947.

FELDSPAR

Quebec and Ontario, are the principal producers of feldspar in Canada, but it is known to occur in Manitoba. The 1948 consumption figures are not available but distribution by industries shows that the following amounts were consumed in 1947:

Cleansers	4,058 tons
Glass	3,267 "
Enamelling	1,690 "
Clay Products	6,975 "
Abrasives	23 "

The clay products industries showed the largest increase in usage, the amount being 45 per cent greater than in 1946.

FLUORSPAR

Ontario, British Columbia and Nova Scotia are the principal sources of Fluorspar in Canada. In 1948 all the production was confined to Ontario. It is interesting to note that from 1905, when the mineral was first produced in Canada to the end of 1948, output totalled 130,664 tons valued at $2,986,623. Of this quantity Ontario furnished nearly 67% of the shipments, British Columbia slightly over 32% and Nova Scotia the trifling remainder. The British Columbia shipments came from the Grand Forks area of the Province.

The occurrence of fluorspar in western Canada is of importance in that, to serve future western Canadian metallurgical and heavy chemical industries, the haul from British Columbia would prove much more economical than a corresponding haul from the East.

GRAPHITE

Production of graphite in Canada in 1948 continued to be derived solely from Ontario. Occurrences of flake graphite are known in Manitoba and British Columbia, and bodies of amorphous graphite in New Brunswick were worked on a small scale many years ago.

Sales of finished graphite products in 1948 amounted to 2,539 tons valued at $239,931, the United States taking 78 per cent of the total shipments.

Imports of ground and manufactured graphite at $333,679 in 1948 showed a decrease of $43,746 compared with the 1947 imports. Imports of unmanufactured graphite in 1948 were valued at $81,899, to which Mexico contributed $45,063.

Imports of crucibles in 1948 had a value of $116,999, United Kingdom being credited with $59,265, U.S.A. with $57,517, and France with $217.00.

In Canada, the use of graphite is generally confined to foundry, dry battery, packings, lubricants, and the paint trade. The construction of "atomic piles" for production of atomic energy calls for considerable quantities of specially refined artificial graphite, and it is reasonable to assume that production figures will show considerable increases in the future.

GYPSUM

There is gypsum in every province in Canada except Prince Edward Island. In 1948, Nova Scotia was the outstanding producer followed in tonnage by Ontario, Manitoba, British Columbia and New Brunswick.

To date gypsum has not been produced in Alberta, though large deposits are known to exist, particularly in the Peace River district where gypsum is exposed on both banks of the river continuously for a distance of fifteen miles. The exposures vary in thickness from a few feet to a maximum of fifty feet.

LIMESTONE AND LIME

Limestone suitable for lime manufacture is available in all Provinces with the exception of Prince Edward Island.

In Alberta, only high-calcium lime is produced. In the more highly industrialized areas such as Ontario and Quebec, there is a shortage of easily worked and accessible deposits of pure high-calcium limestone, that will produce a white lime suitable for chemical requirements.

In the chemical and metallurgical industries lime is one of the great basic raw materials, and over 90% of the Canadian production is used by these two industries. Lime suitable for most purposes, could be made easily available in Edmonton from a

number of sources close to the City. For instance, some 200 miles west of Edmonton on the coal branch line of the C.N.R. and situated near Cadomin, there is high grade limestone available. The plant processing it is at the moment small but would undoubtedly enlarge with a demand for its product. A sample of lime produced at this plant showed the following analysis:

Ignition Loss	0.51	per cent
Silica	0.72	" "
Alumina	0.37	" "
Calcium Oxide	97.70	" "
Magnesium Oxide	0.42	" "
	99.72	

MAGNESITE AND BRUCITE

Magnesitic dolomite is mined for use in the production of basic refractories, dead-burned grain material, bricks and shapes, and finely ground cements.

Brucitic limestone is quarried and processed for recovery of magnesia and lime, the former being used for making magnesium metal, basic refractories, and fertilizer.

Deposits of magnesite occur in British Columbia and the Yukon. The most important of these is situated at Marysville, B.C., and though it contains considerable silica and alumina, a method has been evolved whereby the greater portion of these impurities can be removed. However, there is no production as yet.

In 1948 the value of products made from magnesitic dolomite and brucitic limestone was $1,824,489, compared with $1,238,948 in 1947. Imports of dead-burned and caustic-calcined magnesite, magnesite fire brick, magnesia Alba and Levis, magnesia pipe covering magnesium carbonate, and magnesium sulphate had a value of $1,720,990 in 1948.

Exports of dead-burned basic refractories in 1948 were valued at $203,671, compared with $81,686 in 1947.

MARBLE

Production of marble in Canada in 1948 was credited to quarries operated in Quebec, Ontario and British Columbia. Production consisted chiefly of terrazzo chips, stucco dash, poultry grit, marble flour, whiting substitute, rubble and material for making artificial stone, and there was a small output of squared blocks for sawing into slabs for interior decorative use.

MICA

Canada's supply of mica comes mainly from Quebec, Ontario and British Columbia, in that order. In 1948 the output comprised scrap mica, ground mica (including ground mica produced from

flake mica), and sheet mica. Over 93 per cent of the total quantity was made up of ground and scrap mica. Sheet mica accounted for 216 tons, 84 per cent of which was furnished by Quebec and the remainder by Ontario. Of the ground mica sold, 83 per cent was produced in Quebec and the remainder in British Columbia.

NEPHELINE SYENITE

Nepheline syenite is mainly produced by Canada and Russia, Canada being the sole source of high-grade ceramic material. Nearly all of the Canadian production is consumed by the ceramic industry, chiefly as a feldspar substitute by the glass trade.

Canada's production to date has all come from Ontario, but extensive bodies are known to exist in the Field area of British Columbia.

The 1948 production of crude nepheline syenite in Canada totalled 74,386 tons. Sales of processed material made in Ontario amounted to 21,080 tons, valued at $295,800.00. The U.S. took 60,537 tons of crushed crude rock and processed material, some of which was delivered from stockpiles built up in former years.

Production of crude nepheline syenite in Canada in 1948 increased 31 per cent over the 1947 output.

PYRITES AND SULPHUR

The output of pyrites in Canada is obtained as a by-product from the concentration of base-metal sulphide ores. For a number of years pyrites has not been produced as a primary mineral. Production is centred around Quebec and British Columbia, the large output from the latter source going to the acid plants and paper mills of that province.

No deposits of commercial grade native sulphur have been found in Canada, but sulphur occurs in combination with copper, nickel, lead, zinc and iron (pyrites). Deposits of these have already been described elsewhere.

Out of twelve main industries using sulphur, the pulp and paper industry heads the list with 253,423 tons consumed in 1947, while heavy chemicals with 228,710 tons came second. None of the remaining ten came anywhere near the first two in consumption figures.

ROOFING GRANULES

Consumption and imports of roofing granules in 1948 were slightly lower than in 1947. Users continued to show increasing preference for artificially coloured granules over the natural material.

The granules consist of small broken particles of rock or slate in their natural state or artificially coloured, which are

affixed to asphalt sheeting. The under-side of the sheeting is coated with a film of talc or fine mica and is then cut into strips for roofing shingles and for sidings (resembling rows of bricks separated by mortar). The exposed part of the improved shingle has an undercoating, usually of natural granules, upon which another coating of the required coloured coating is spread.

The present supply comes from three sources in Ontario and four in British Columbia. Consumption of roofing grnaules in Canada during 1948 amounted to 113,085 tons, valued at $2,471,-159. Imports of all types and colours amounted to 72,222 tons, valued at $1,612,957; this amounts to 64 per cent of the total quantity used.

A general search has been going on for some time for a suitable supply of rocks in Canada for making the best type of granules. Tests by the Federal Bureau of Mines on slates and rocks from various Canadian deposits gave satisfactory results in several cases.

SILICA

In Canada the silica materials produced are quartz, quartzite, sandstone and silica sand. Sources of supply are chiefly Ontario, Quebec, Saskatchewan, British Columbia and Nova Scotia.

There is a sand of a high-silica—98.8 per cent—content suitable for glass making which is found in the Peace River district of Alberta, and as residue from the oil-separating plant at Bitumont, Alberta.

In 1948 Canada produced 1,920,120 tons of quartz and silica sand, valued at $2,073,395, and silica bricks to the value of $367,742. Imports of silica, chiefly in the form of high-quality silica sands, were in record quantity in 1948—584,019 tons, valued at $1,446,624.

Exports consisted of 228,100 tons of quartzite, valued at $494,284.00.

SODIUM CARBONATE (Natural)

Sodium sulphate (natural) and other sodium compounds have been dealt with in another part of this publication. However, it may be of interest to note that deposits of natural sodium carbonate occur in a number of small lakes in British Columbia. Most of the small production since 1921 has been absorbed by soap and other industries in Vancouver. The last recorded production was 286 tons in 1945, valued at $3,146.00.

Sodium sulphate occurs in highly concentrated brines in many of the lakes in Western Canada. In 1921 the Mines Branch, now the Bureau of Mines, Ottawa, investigated the deposits in Western Canada and over 120,000,000 tons of hydrous salts were proved in the few deposits examined in detail. It would appear,

however, from subsequent information that only 75 per cent of this tonnage is recoverable.

SODIUM SULPHATE

Canadian output of sodium sulphate comes from Saskatchewan, in which province, and elsewhere in Western Canada, large reserves of sodium sulphate occur in beds and in the form of highly concentrated brines in many lakes and deposits.

The sodium sulphate recovered from these sources is in the hydrous form (55.9 per cent water of crystallization), and is known as "glauber's salt". As a rule, the water of crystallization is removed in rotary kilns before the material is shipped to markets as anhydrous sodium sulphate.

In 1948 production of sodium sulphate amounted to 163,290 tons, valued at $1,793,043.

Imports from the United States and the United Kingdom amounted to 11,212 tons, valued at $213,656, and exports to the United States was 47,025 tons, amounting to $532,148.00.

TALC AND SOAPSTONE

The principal production of talc is confined to Eastern Quebec and Hastings county in Ontario. Quebec talc is a grey, slightly off-colour material, classed for statistical purposes as soapstone. The product from Ontario is of prime white grade. Each province produces about equal amounts. In British Columbia, some ground soapstone for local roofing and building use is produced in Vancouver from waste imported from the State of Washington, United States.

There is a surplus in Canada of most grades of ground talc. Canada produces its entire requirements of sawn dimension soapstone and talc crayons, but supplies of certain qualities of ground talc required by the ceramic, paint and cosmetic trades are imported.

Chief users in 1948 of talc and soapstone in Canada by industries were as follows: Roofing products, paint, rubber, insecticides, pulp, paper, cosmetics, pharmaceutical preparations, and clay products.

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